

# Procomp Domiciliary Care Workforce Evaluation

Evaluation report

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# Executive summary

## Context

With Skills for Care reporting an average vacancy rate of 9.9% and a turnover rate of 28.3% for the adult health and social care workforce, significant pressures are impacting workers, service users, and local authorities (LA) (Skills for Care, 2023). Such pressures may be attributed to the standards in which the workforce operates in, with workers reporting issues of low pay, 22% of filled posts having zero-hour contracts, and providers struggling with low workforce utilisation (Skills for Care, 2023).

Due to scarce public funding and inefficient working practices, innovation has the potential to improve utilisation of the current workforce to offer relatively low-cost solutions to build workforce capacity (Toner, 2011).

Procomp are a Finnish technology company specialising in workforce optimisation and logistical planning. Their strategic optimisation service aims to improve workforce utilisation and operational efficiency by offering alternative planning solutions, to support policy makers, commissioners, and other key-decision makers, providing the basis for the Domiciliary Care Workforce Programme.

## Purpose

Unity Insights were commissioned by Health Innovation West of England, formerly West of England Academic Health Science Network, to independently evaluate the Domiciliary Care Workforce Programme, assessing the

effectiveness of Procomp's Strategic Optimisation Service in supporting the social care workforce. The evaluation uses data gathered from two care providers in the Southwest.

The scope of the evaluation aimed to answer questions on the acceptability and implementation of the solution, effectiveness against desired outcomes, a value-based health economic review and the potential environmental sustainability. This included perspectives from the local council, providers, domiciliary care staff and the wider healthcare system.

## Limitations

### 1. External factors

The real-world nature of the evaluation introduces inherent limitations as numerous uncontrolled variables impact the data. Notably, the landscape of care delivery has undergone changes during the data collection period which may influence the observed results. This includes changes to supply and demand via sponsored workers being onboarded, decreasing care package sizes (value and resource requirement of the average client care package), fluctuations in number of workers / clients, and reduced waiting lists being described.

### 2. Visit length distribution

Analysis of the reported visit lengths in one site showed peaks at various lengths rather than a normal distribution. This may indicate that timings provided are subject to rounding

up. This may be skewing results within both the quantitative and health economic results.

### 3. Travel distance analysis

Due to information governance (IG) requirements, data provided for travel distances by domiciliary care staff did not include travel to and from home and full client postcodes.

### 4. Cost benefit analysis

Several metrics forming the benefit streams calculations are expected to be impacted by external factors, potentially nullifying benefits, this includes:

- Travel distances not changing significantly whilst servicing a larger region.
- Retention rate fluctuations due to the introduction of sponsored workers and demand / supply variation.
- Care package optimisation may also be subject to fluctuation in the demand and supply of the market with less inclination to utilise added capacity.

The third scenario modelled is based on a scaled-up estimated rollout across the South West, this assumes uniform applicability of results from specific sites (A and B) to the entire region. In reality, variations exist in care practices, workforce dynamics, demand, market structure and infrastructure across different locations which impacts the generalisability of results.

## Insights

### Barriers & enablers uncovered

The full pilot period included two domiciliary care providers. Several providers declined to

participate, and one dropped out at the interim stage primarily due to a perceived lack of need for changes.

Changes introduced, according to the project team, included flexible start times, balancing demand by having noncritical activity at off-peak times, discussions around gender of care worker, use of optimisation software by providers, reviewing double-ups and reviewing care assessment practices.

A number of barriers to implementation were identified. For providers these included a lack of resource and ability to process data, delay in receiving recommendations, client requirements and nuances not considered in the data and variation in current provider practice. Councils noted a cultural resistance to change, especially during the onboarding process, reporting slow, minor change being preferred by providers.

Although barriers existed, two sets of changes were accepted by both councils and providers across the data capture timeline. The second set of changes were considered easier to implement.

Opportunities offered by Procomp were discussed. Responses included a reduction in mileage between appointments; better use of capacity potentially leading to improved staff well-being and service user care; and from a commissioner perspective, less travel leading to more pay due to more contact time in the working day. Both providers felt the intervention would be applicable for wider rollout.

### Effectiveness metrics

An improvement in quantitative data on staff retention rates was expected. One site showed an improvement, the second site had

a negative result, but was contextualised by the site lead as due to external factors, and so excluded. This raises concerns attributing Procomp's intervention on this metric, especially in the shorter-term.

Quantitative findings suggested differing outcomes for sites regarding continuity of care. Site A and Site B both show no change in continuity, with an average of 14 and 15 care workers seen by clients at each site respectively across both periods. Therefore, no substantial impact on continuity is observed.

Travel distances saw minimal variation to baseline averages, Site A = +0.02 miles, site B -0.08 miles. Reduction the month directly after implementation was seen for both sites (Site A, -7.8%; Site B, -4.0%), impact is diluted over time if frequent changes do not occur.

Qualitative data suggests a potential improvement on travel distances. Several staff reported less need to cut appointments short and reduced travel requirements.

## Value

The beneficiary of the modelled streams are the providers, with efficiency gains in operations, however, this indirectly supports LA's to be able to service a greater level of demand.

Results within this evaluation demonstrate a slight positive return on investment primarily due to improved care package ratios. These results need to be considered alongside variations in the landscape that is expected to have impacted the metrics within these calculations.

The results suggest that strategic optimisation software, such as Procomp, is

capable of creating savings through care package efficiency, reduced travel distances and retention rate improvements, highlighting the potential for a sustained positive impact.

The cost-benefit analysis (CBA) estimated Benefit Cost Ratios (BCR) and Net Present Values (NPV) over the five-year period (2023/24 - 2027/28). Three scenarios are presented, the first reviewing results from one site only, the second combining results from both sites, and the third showing hypothetical rollout across the South West to further providers. The results are shown below:

- Scenario 1: £2.99 for every £1 invested. NPV = £41.1k
- Scenario 2: £3.58 for every £1 invested. NPV = £106.7k
- Scenario 3: £3.28 for every £1 invested. NPV = £4.63m

Overall, from a value perspective, the impact of this intervention remains unclear although with positive potential, and requires further investigation before definitive conclusions can be drawn. This is due to variability in results between sites, changing landscape influences and limitations of the data.

## Care worker perceptions

In the qualitative study, domiciliary workers noted that they experienced considerable improvements in working conditions as a result of the implementation. Core measures that improved included satisfaction with; their workload (Site A: +21.2%; Site B +35.1% satisfied or very satisfied), time between visits (Site A: +44.8%; Site B +15.6% satisfied or very satisfied), and overall job satisfaction (Site A: +7.1%; Site B +40.2% satisfied or very satisfied).

These results are expected to have positive knock-on effects on operational elements for care providers such as staff retention rates in the longer term.

## Recommendations

### Integration & acceptability

- Enable providers to have direct access to the optimisation interface, to minimise the time delay and data entry requirements as well as empowering regular review and implementation of changes for the providers.
- Greater transparency and consistency of data collection regarding the format of planned and actual visit lengths with allocation of travel time.
- Embedding functionality to accommodate for visit requirements. Many optimisation recommendations had acceptability concerns from providers involving conflicts with client specific requirements or other nuances not considered. These include staff skill, parking requirements and client preferences.

### Further evaluation

- It is recommended that additional data collection within the current pilot occurs, as well as increased number of sites, before conclusions are reached determining impact on long-term metrics such as care worker retention rates.
- According to the intervention and project team, rota reviews and changes should be occurring regularly, aiming for a weekly basis.

This could drastically impact findings within this report as results may be diluted over time. It is recommended that implementation of changes at this frequency, for a sustained period, is attempted and evaluated to better understand the full potential of the optimisations.

- Further work evaluating optimisation should aim to stabilise operating conditions of the care workers, to avoid external factors affecting results. One solution may include shorter data collection periods, by considering impact over a weekly timescale rather than monthly, with regular and consistent optimisation occurring. Another method could be to review retention data results further to create a potential difference-in-difference analysis against an appropriate local comparator.
- Capturing precise working hours and turn-over rates would create a more reliable assessment of the impact of optimisation on workforce efficiency. Additionally, multiple stakeholders have noted that care package sizes have decreased during the intervention period, data seeking to review the attribution of this impact to Procomp is recommended.
- Finally, measuring the impact on service users, given that these services exist to support these people, should be explored further. This may include a review of service quality and availability due to the intervention.



# 1. Introduction

## 1.1. Context

Currently, there are significant pressures and demands on the health and social care workforce, impacting staff, service users, and local authorities. Skills for Care, a strategic workforce development and planning body for adult social care in England, reported that the national average vacancy rate for the adult social care workforce in England is 9.9%, with an average turnover rate of 28.3% (Skills for Care, 2023). This may be attributed to the conditions and standards which the workforce operate in, with 22% of filled posts being zero-hour contracts and median pay, as of March 2023, at £10.11 per hour, down £0.35 per hour from March 2022 (Skills for Care, 2023).

Results from the National Care Forum survey in 2021 reported that 74% of providers are observing an increase in staff exits, with responses noting “*stress/wanting an easier job*” and “*finding better pay elsewhere*” as key reasons for staff leaving (National Care Forum, 2021). It is apparent that more staff are needed, and conditions must be improved to retain staff members in the workforce.

Considering public funding is scarce, innovation has the potential to improve the efficiency and utilisation of the current workforce while identifying key issues to address and offering relatively low-cost solutions (Toner, 2011). To build workforce capacity, solutions must be implemented at an individual, organisational, and systems level to ensure solutions are put into practice as intended (Goldberg & Bryant, 2012)

The requirement for improved efficiency, however, is not solely focused on cost. The national net zero agenda makes it necessary to identify potential routes to net zero emissions. The health and social care system has been identified as an area where carbon emissions can be reduced, particularly in home care, which typically requires workers driving to appointments (NHS England, 2023). The requirement for relatively low-cost solutions make optimisation a feasible target.

## 1.2. Project overview

### **Service**

Procomp are a company from Finland specialising in logistics and workforce optimisation who have developed a ‘Strategic Optimisation Service’ aimed at improving workforce utilisation and operational efficiency. This is powered by Procomp’s AI-based ‘R2 optimiser’ technology, which analyses operational processes, producing detailed models which are used to provide alternative planning solutions. The service can be applied to analyse work patterns, including geographical work patches, planning practices, team sizes, roles and responsibilities and can help manage and improve outsourcing practices.

The technology-based service is currently being tested for implementation across the UK's public services, in a programme operated by Bristol City Council and Cornwall Council and supported by Health Innovation West of England (formerly West of England Academic Health Science Network), Health Innovation South West (formerly South West Academic Health Science Network), and NHS England Workforce, Training and Education South West (formerly Health Education England South West) in the domiciliary care workforce in the South-West of England. The programme intends to assess the implementation of Procomp's technology at a smaller scale to inform procurement decisions by public services for wider adoption of the technology. The programme included two key work stream scenarios, defined by the programme as scenario 1, considering care assessment and brokerage practices; and scenario 2, focusing on provider market utilisation practices. This evaluation only covered topics relevant to scenario 1.

The technology offered by Procomp hopes to address many of the workforce issues currently facing the UK's public services, by improving utilisation and efficiency of the existing workforce through remodelling operational practices. Other solutions may be available, however the project team, using a selection criterion prior to the evaluation, determined Procomp would be utilised for this pilot. More details on Procomp and the services they offer can be found on their website (<https://procompglobal.com/>).

A logic model designed by personnel from the project team and relevant external stakeholders identified expected outcomes of the intervention. Service users were hoped to benefit from shorter waiting lists, and improved care worker continuity (i.e., the same care worker providing care to a service user over multiple visits), facilitating a more person-centred approach to care. Meanwhile, care workers were expected to experience a reduction in car mileage and travel time, improved work patterns and workload balancing, and increased time with service users. For a large proportion of the workforce, a combination of reduced travel time and increased time with service users could lead to a higher ratio of remunerated to non-remunerated time. Higher staff satisfaction typically leads to greater staff retention; hence, providers were anticipated to benefit from lower staff turnover, in addition to a reduction in operating costs through improved efficiency.

## **Council and provider selection criteria**

The consortium of Health Innovation South West, NHS England Workforce, Training and Education South West (formerly Health Education England South West), and Health Innovation West of England created a selection criterion for council and provider sites to form part of the pilot. For council selection this included scoring mechanisms on capacity, Digital Technology Assessment Criteria (DTAC) and Data Protection Impact Assessment (DPIA) agreement, history of adoption, and the providers suggested to take part.

Local councils selected the providers to include. In Cornwall, all providers operating within a region of desired impact were invited, whilst for Bristol, a particular provider was selected due to the area serviced and existing relationship with the registered manager and owner.

## **1.3. Evaluation overview**

Unity Insights were commissioned by Health Innovation West of England to independently evaluate the Domiciliary Care Workforce Programme, assessing the effectiveness of Procomp's Strategic Optimisation Service in supporting the social care workforce. The evaluation sought to understand the impact of the technology on the service users, the care workers, and the providers within the programme to support local authorities with decisions regarding the implementation of the technology at scale, as set out in the programme logic model contained within Appendix G: SWAHSN original Theory of Change model.

The evaluation focuses on both process and impact, meaning it aims to understand how the intervention was implemented and the lessons learnt. In addition, it assesses the monetary impact of Procomp, as well as the user and provider experiences. The aim of the evaluation is to see if the intervention is meeting its intended goals, including views on how the programme is delivered, the services it provides, and how it was carried out. This assists in reviewing the success of implementation, while providing information such as whether the programme could replicate in other regions or provider services.

Specifically for this project, the evaluation intended to overall develop an understanding of how the technology integrates with public services, developing a knowledge base through quantitative and qualitative research and analysis. In addition, a cost-benefit analysis has been performed, projecting the financial impact of the intervention for one to five years to inform the return on investment for local authorities and NHS commissioners.

To determine the success of the programme, the optimisation process has been evaluated against the following key objectives:

- Identifying improved planning, assessment, and brokerage practices.
- Impact on workforce satisfaction, retention, and sickness.
- Having a positive impact on local authorities (LA) and provider key performance indicators (KPIs) and metrics related to the benefit streams listed in section 2.2.

## 1.4. Purpose of the document

The purpose of this report is to outline the objectives, methodologies, and findings of Unity Insights' evaluation of Procomp, as implemented in the Domiciliary Care Workforce Programme. This evaluation seeks to assess the acceptability impact of the proposed strategic changes and optimisations facilitated by Procomp across various aspects of the domiciliary care services. Whilst the impact on the workforce was a key focus of the evaluation, the broader implications for care providers and service users were also considered. This report presents the context and rationale for the evaluation, outlines the benefits and implications of the optimisation and presents findings from the various analytical components of the evaluation to describe the observed impact.

## 2. Methodology

### 2.1. Evaluation questions

The following evaluation questions were designed to address a range of key areas including acceptability, implementation, effectiveness, environmental sustainability, and value to support a comprehensive and well-rounded evaluation. Discussions with the project team have established the following questions as the key priorities given budget and time restrictions. The questions listed below remain unchanged from when they were initially outlined in the Unity Insights evaluation framework.

#### **Acceptability and implementation**

- 1) How many providers within the pilot sites have enlisted into the intervention?
- 2) What are the key enablers and barriers to successful implementation of the intervention as perceived by the council staff and domiciliary care workers?

#### **Effectiveness**

- 3) How have domiciliary care workers been impacted by the intervention?
  - What is the impact on workers' retention rates?
  - What is the impact on workers' satisfaction levels?
  - What is the impact of a change in the continuity of care?
  - Has communication between local authorities and domiciliary care providers changed?

#### **Value**

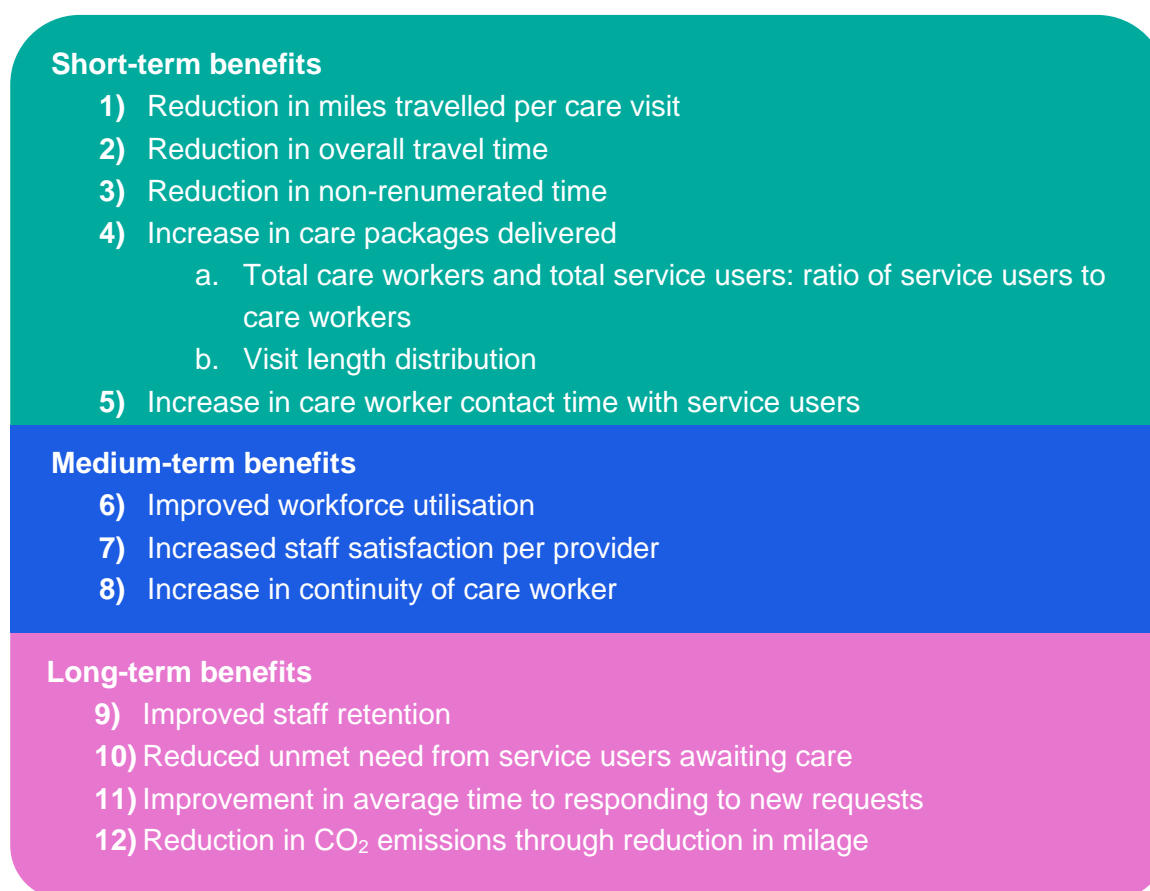
- 4) What is the financial impact, because of the introduction of Procomp, for the optimisation level of the workforce?
  - How has the capacity and utilisation of the workforce changed?
  - Is an impact of average travel mileage to service users for domiciliary care workers observed?
  - What is the impact on recruitment needs for the service?
  - How could Procomp impact the health and social care system from wider implementation?

#### **Environmental sustainability**

- 5) What impact has Procomp had on the carbon emissions from domiciliary care workers travelling for work?

## 2.2. Identified benefits

The benefits that will form part of the evaluation have been determined by reviewing the original Health Innovation South West evaluation protocol and considering current evaluation scope and resourcing priorities. Discussions with the project team have informed these priorities to produce the list of identified benefits presented in Figure 1. Metrics associated with these benefits, which have been explored for the evaluation, are listed in Appendix A: Metrics table.



**Figure 1: Benefits identified for the evaluation.**

## 2.3. Evaluation setting

### Provider sites

The provider service operates through commissioning agreements in place with the local authorities for provision of domiciliary care services or 'care packages' for the surrounding area. These providers then best allocate their resources to provide this service via 'rounds', which

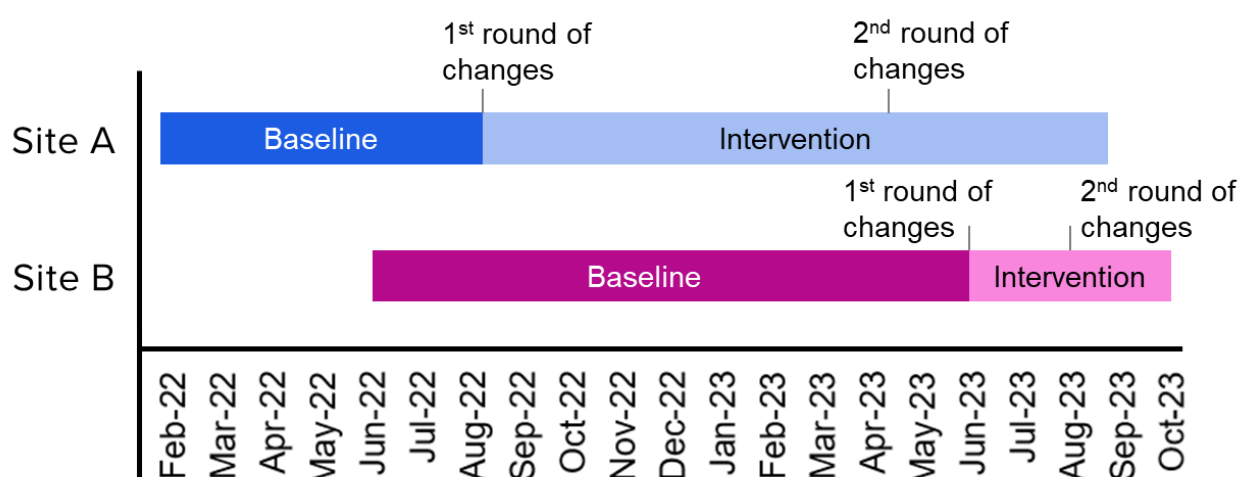
incorporate the required skill mix and route layout for the domiciliary care workers to travel to service user homes.

Procomp is being implemented as part of the Domiciliary Care Workforce Programme in Bristol City Council with a care provider, and in Cornwall City Council with one provider. One other provider based within Cornwall City Council was initially included as an implementation site for the evaluation; however, they were not included in the final analysis as they decided not to proceed with the intervention. As a result, the decision was made by the project team to not present baseline findings for this site, as this would not add value to the evaluation. The recruitment of just two providers meant that the sample size of the pilot was relatively small, impacting the reliability and generalisability of findings.

The purpose of the data presented within the report was not to draw a comparison between sites; rather, to understand the impact that Procomp’s service has had, or will have had, once changes based on their recommendations are implemented. Therefore, the two implementation sites have been anonymised throughout this report, and are instead referred to as Site A and Site B.

## Timelines

Evaluation timelines are split into two key periods, comprising of the baseline and the intervention periods. The baseline period (BL) represents the period before changes to care rounds were made based on recommendations by Procomp. The intervention period (IN) represents the period after changes to care rounds were made based on recommendations by Procomp. Although defined as one period, changes were made to care worker schedules on two occasions for each site, as indicated in Figure 2. While changes were only implemented on two occasions across the entire intervention period, the intention is for Procomp to be used in a real-world setting to routinely review and optimise rounds on a weekly or even daily basis.



**Figure 2: Timeline of changes being made to care rounds based on recommendations by Procomp.**

The data collection period for the evaluation was initially agreed to be 12 months between October 2022 and October 2023, alongside 12 months of historical baseline data preceding the data collection period from October 2021 and October 2022. Complications with the implementation of the rounds, however, resulted in changes to these timelines, resulting in those presented in Figure 2.

For site A, data was available starting in February 2022 and changes were first implemented in the week commencing the 5<sup>th</sup> of September 2022. Site A implemented new optimised care rounds on the 17<sup>th</sup> of April 2023, and data was provided up until the end of August 2023.

For Site B, data was available from October 2021 until October 2023; however, only 5 months of intervention data was provided due to delays in implementation. As a result, the baseline period was defined as the 12-month period prior to changes being made. This was determined to be from June 2022 until the beginning of June 2023, where the first round of changes were made to care rounds. The second batch of optimised care rounds were implemented on the 9<sup>th</sup> of September 2023, and data was provided up until the end of October 2023.

## 2.4. Evaluation population

The intervention affects a range of different population groups, all of which must be clearly defined to capture how the service impacts individuals at different levels. Different populations must also be considered when defining benefit streams, by focusing on who the intervention impacts directly, in other words, the primary population, and the secondary population who are impacted as a result.

### **Primary population: Domiciliary care workers and providers**

The service provided by Procomp is expected to have the greatest impact on the domiciliary care workforce, making them the primary group to be evaluated from both the worker and provider perspectives. Consequently, most of the identified benefits and evaluation questions were centred around the domiciliary care workforce.

### **Secondary population: Council staff (commissioners)**

Input from council workers is key to the wider adoption of the intervention, given that the basis of the programme is to examine how well the service integrates into local public services. The project may impact this group via changes to the commissioning levels and efficiency of providers, resulting in their categorisation as the secondary population group for the evaluation.

### **Out of scope: Service users**

While service users are likely impacted by the service, the evaluation is focused predominately on understanding the impact of the intervention on the workforce and the wider system. Any observed benefits to the service users were only captured through quantitative metrics and self-reported care worker feedback.



An estimated size of the population of workers and service users for each of the provider sites is presented in Table 2 of the Quantitative insights.

## 2.5. Qualitative data collection

### Staff survey

Qualitative insights into the impact, acceptability, and experience of the intervention were captured through a survey based on the original SWAHSN design, before refinement by Unity Insights and Health Innovation South West. The survey was distributed by Health Innovation South West to domiciliary care workers, care co-ordinators and managers, who were offered a coupon incentive to participate.

Surveys were conducted before and after Procomp's service was implemented to enable a pre- and post-comparison to observe how the optimisation impacted the workers. The survey conducted before changes were made is defined here as the 'baseline' survey, and the survey conducted after is defined as the 'intervention' survey. Findings from the baseline survey as presented in the interim report were used to inform updates on the questions asked for the final survey. Results were separated by provider, given that each site had their own operational procedures and different baseline satisfaction levels, to focus primarily on the impact of the changes proposed by Procomp.

The surveys considered a range of measures to understand staff satisfaction across several different factors, and additionally, some demographic and operational data was collected. Free text responses were also captured in the survey to gain additional insights into the issues affecting the workforce and the staff's perception of the intervention.

Responses to the baseline survey were collected in August 2022 for Site A and September 2022 to November 2022 for Site B. Responses to the intervention survey were collected from late September 2023 to October 2023 for both Site A and Site B. Response rates for both surveys are presented in Table 1, and a full list of questions is located in Appendix D: Care worker survey questions.

**Table 1: The number of responses recorded (*n*) for the baseline and intervention surveys. For Site A, 13 completed the full baseline survey and 11 completed the full intervention survey. For Site B, 11 completed the full baseline survey and 7 completed the full intervention survey.**

Provider	Baseline responses	Intervention responses
Site A	<i>n</i> = 19	<i>n</i> = 15
Site B	<i>n</i> = 13	<i>n</i> = 9



## Interviews

Further data regarding acceptance of the intervention and experience amongst council staff and provider site leads was collected through semi-structured interviews. Questions were designed by Unity Insights and interviews were conducted by Health Innovation West of England's Evaluation and Insights team. During the interview, notes were taken to gather the key points, and the interviews transcribed using Microsoft Teams.

A total of seven interviews and one focus group were conducted and results were included within this report, covering two councils and two providers. All semi-structured interview questions for council staff and provider site leads can be found in Appendix B: Semi-structured interview questions – Council staff and Appendix C: Semi-structured interview questions – Provider site leads, respectively.

To feasibly analyse results within the scale of the evaluation, a thematic analysis approach was utilised. Overall broad topics were created with themes raised under each, the framework results can be found within Appendix H: Thematic analysis framework.

## 2.6. Quantitative data collection

### Analysis

Quantitative insights presented in this evaluation report were generated from appointment data provided by Procomp containing details on care workers' schedules. The data was provided by Procomp in two batches, containing data from the baseline and intervention periods for each provider to enable a pre and post comparison before and after changes were made.

The appointments dataset included unique anonymised IDs for both care workers and clients for each of the two providers included in this evaluation. Alongside the appointments data, Procomp provided a 'distance matrix' which was used to estimate the distances and times taken by care workers to travel between appointments.

The distance matrix was calculated by Procomp and provides the distance and travel time between each postcode and every other postcode based on road-network data. These post codes were anonymised by translating them into a different number called the 'node ID', producing a unique identifier for each post code. The appointment data contained the same node IDs, allowing the appointments to be linked with the travel distances and times between subsequent appointments from the distance matrix to calculate a range of metrics based on travel distances and travel times by care workers.

When defining and calculating performance metrics, a range of analytical techniques were considered, including pre and post comparisons, alongside monthly averages used to demonstrate trends over time where appropriate.

## Data cleaning and assumptions

In the methodology employed for the evaluation, it is important to note that actuals were reported only for Site A and not Site B. To ensure data accuracy, certain appointments were excluded from the analysis if reported as having a duration of 0 minutes, under the assumption that these appointments did not take place. This issue only affected Site A, since Site B did not report actuals, and affected less than 1% of appointments for both baseline and intervention periods.

The data received for Site A included 'live in' type appointments, which were excluded from the analysis given that these types of appointments were 24 hours, affecting calculations for appointment lengths. The baseline data showed a higher proportion of 'live-in' appointments; therefore, excluding these appointments was deemed necessary to ensure the accuracy and comparability of the data.

## 2.7. Cost benefit analysis

### Cost-benefit analysis general approach

The full evaluation produced an ex-ante (forecasted) appraisal of the prospective impact of the Domiciliary Care Workforce Programme, which was estimated through best available evidence. The appraisal was assessed in line with 'The Green Book'. (HM Treasury, 2022b). The HM guidance is applied throughout the public sector to ensure consistent estimation of costs and benefits in cost-benefit appraisals. In recent years, the framework has been supplemented by several departmental or sectorial 'external supplementary guidance' documents (HM Treasury, 2022a). The cost-benefit analysis methodology, including optimism bias (OB), discounting, and inflation, is expanded upon in Appendix E: Health economic modelling approach.

### Scenario analysis

Three distinct scenarios have been modelled to comprehensively assess the monetary impact of the Domiciliary Care Workforce programme across varying levels of demand and different cohorts. These scenarios aim to analyse the estimated monetisable outcomes, both current and potential, and understand the programme's actual and potential future impact. The three scenarios are summarised below:

- **Scenario 1:** Assessment of the financial impact of implementing Procomp in Site A only.
- **Scenario 2:** Assessment of the financial impact of implementing Procomp in Site A and Site B.
- **Scenario 3:** Assessment of the financial impact of implementing Procomp across a wider region, such as the South-West.

### Benefits

Key benefit streams were identified through research conducted on available project data. The modelled benefit streams were considered to be non-cash releasing, primarily benefiting providers

yet indirectly benefiting the council by providing greater efficiency from capacity gain to meet demand. The modelled benefit streams are not guaranteed to represent the most significant potential value; however, have been based on supporting evidence such as stakeholder input and literature sources.

All benefit streams are listed below. A detailed methodology for each benefit stream variable is available in Appendix E: Health economic modelling approach.

- 1) Reduction in travel distance
- 2) Increased care packages delivered
- 3) Improved staff retention

## **Costs**

Cost streams associated with the Domiciliary Care Workforce Programme were identified and calculated according to raw data provided by the respective sites. Each cost stream is listed below. A detailed methodology for each cost stream variable is available in Appendix E: Health economic modelling approach.

- 1) Council staff training and maintenance costs
- 2) Implementation costs
- 3) Provider staff implementation and maintenance costs

## ***Model assumptions***

This core assumption was applied in the model:

- 1) The current model does not incorporate certain key elements such as the Procomp license, additional support services, programme management, and coordination within the second cost stream. The model solely focuses on a one-time, upfront cost of care in the first year. This approach may not adequately represent the ongoing operational costs or the detailed financial nuances of the project over an extended period. Future models could consider these elements to provide a more accurate and holistic view of the financial implications of the project.

The following assumptions relate specifically to the Scenario 3 extrapolation:

- 2) All benefit streams and cost streams 2 and 3 for Scenario 3 had a universal scaling factor of 62.04 applied to the variables of Scenario 2 in order to produce an extrapolation forecast to the entire South West region of England. This value was assumed by dividing the total number of residential care clients within the South West of England region (18,425) by the total number of distinct clients seen in Scenario 2 (297), which produced a figure of 62.037 (NHSE, 2023).
- 3) Cost stream 1 within Scenario 3 had a scaling factor of 7.5 applied to results from Site A and B to account for extrapolating to include all 15 local authorities within the South West region.

- 4) The model assumes that the outcomes observed at Site A and Site B are representative and can be uniformly applied across all sites in the South West region. This approach may oversimplify the complexities inherent in each site. It fails to consider unique site-specific variables that could influence outcomes, suggesting a need for a more nuanced approach in future evaluations.
- 5) Due to the logistical constraints of not being able to directly engage with every site or provider in the South West region of England, the assumption was made that each site or provider is initiating their use of Procomp without pre-existing software or processes. This assumption may not accurately reflect the reality, as sites vary in their existing systems and infrastructure. The diversity in technological starting points and operational environments at each site must be factored into any comprehensive future evaluations, as it significantly affects the impact and implementation of Procomp.

## 3. Results

### 3.1. Qualitative findings

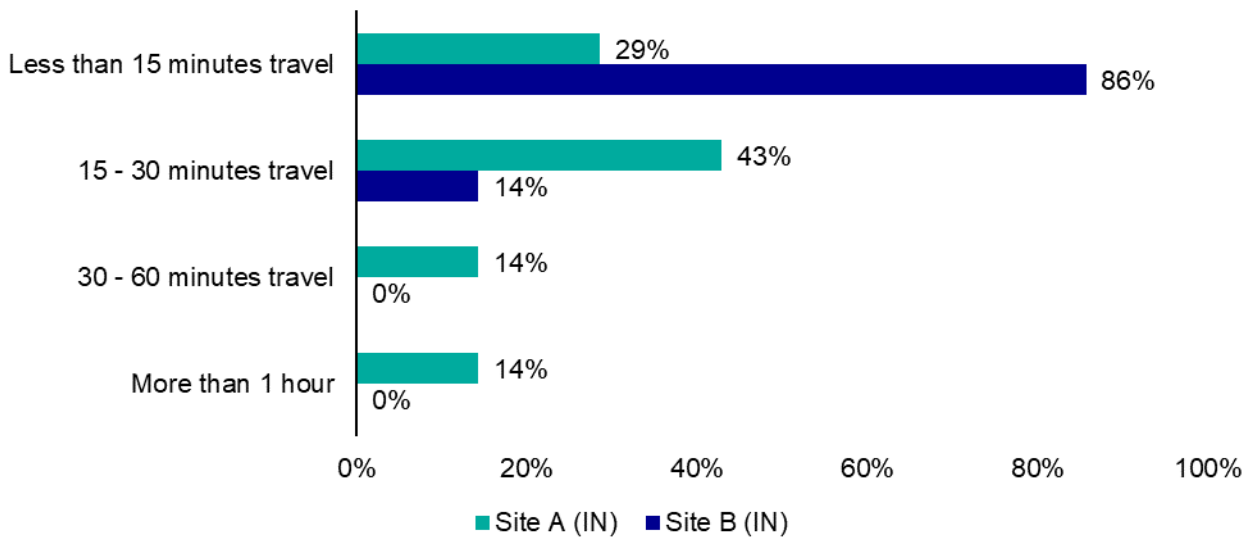
#### **Staff survey**

Results for the staff surveys from Site A and Site B, before and after changes from Procomp were implemented, are presented in this section.

#### ***Multiple choice responses***

To further understand the characteristics of the care workers at each site, respondents were asked to provide information regarding their age range, gender, and ethnicity. For gender, a response option for '*prefer not to say*' and '*other*' was provided, but no responses were given for these categories. Results describing the characteristics of the responding care workers is presented in Appendix I: Cohort characteristics.

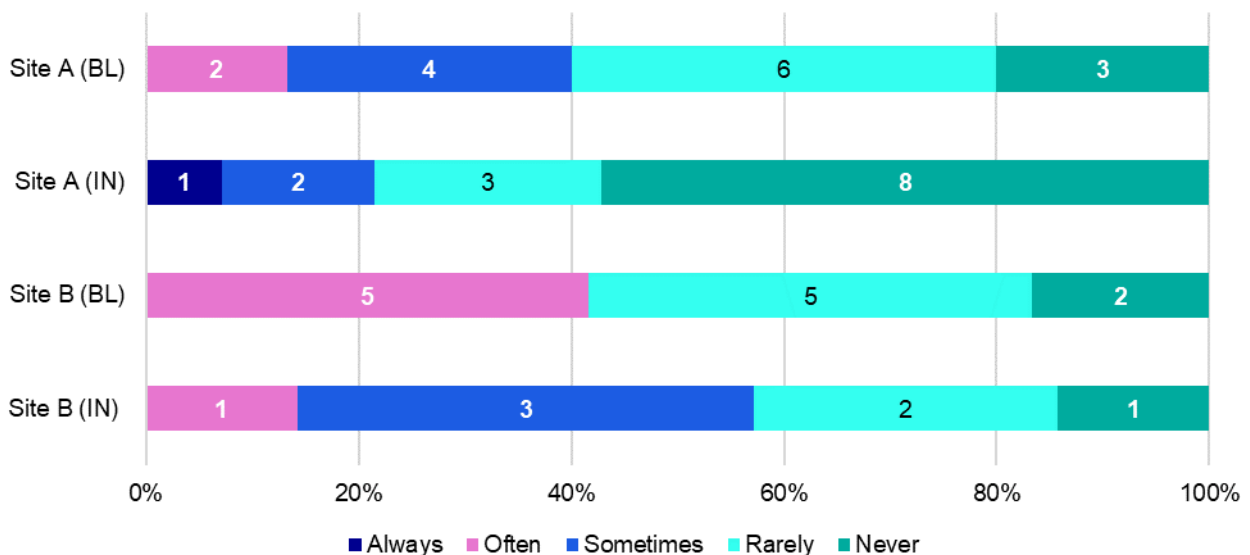
Respondents were asked to estimate the time taken to travel to their first visit (Figure 3). This question was a new addition to the intervention survey, meaning there is no baseline for comparison.



**Figure 3: Estimated time taken for respondents to travel to their first visit at both sites.**

Results in Figure 3 suggest that for Site A, most respondents (42.8%) travel 15-30 minutes to their first visit, followed by less than 15 minutes, with some reporting 30-60 or over 60 minutes of travel. A greater proportion of respondents at Site B indicated a travel time of less than 15 minutes (85.7%), with the remaining respondents reporting 15-30 minutes.

The care workers were asked how often they had to cut a session short with a client to make sure they made it to their next visit on time (Figure 4).



**Figure 4: How often respondents had to cut sessions short with clients to make sure they reach the next visit on time.**

Results in Figure 4 for Site A show a higher proportion of respondents indicating they 'never' have to cut sessions short during the intervention period (57.1%), when compared against the baseline (20.0%). Four fewer respondents reported they have to cut sessions short either 'sometimes' or 'often', however, one additional respondent suggested 'always' for the intervention period, compared with none in the baseline.

Respondents were asked to indicate how satisfied they were with different elements of their job, with five response options, ranging from 'Very dissatisfied' to 'Very satisfied' (Figure 5, Figure 6). They were also asked to suggest the extent to which they agreed with a range of statements relating to their role as a care worker, with five response options ranging from 'Strongly disagree' to 'Strongly agree' (Figure 7, Figure 8). Some responses to questions presented in Figure 7 are missing from the baseline results because these were added to the survey after the baseline survey for Site A had been collected.

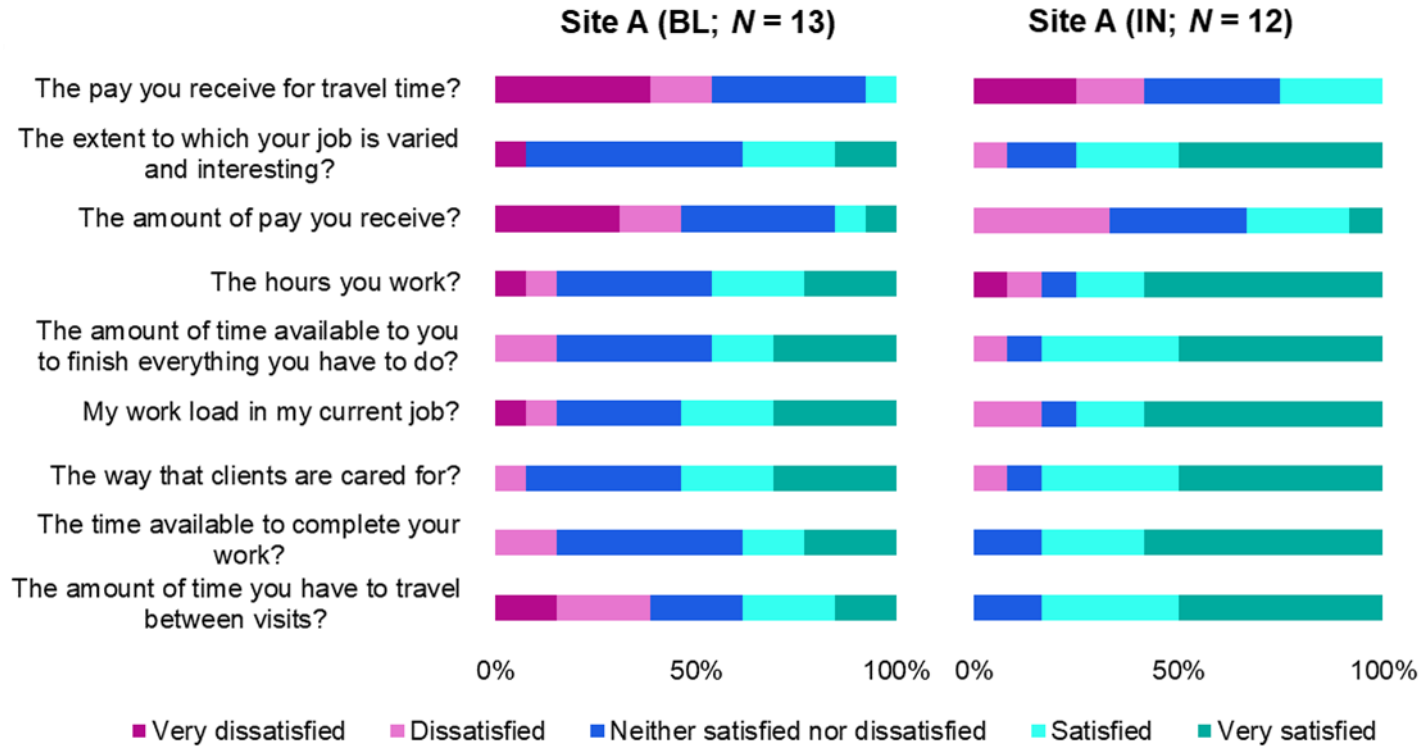


Figure 5: The extent to which clients were satisfied with different elements of their role as a care worker (Site A).

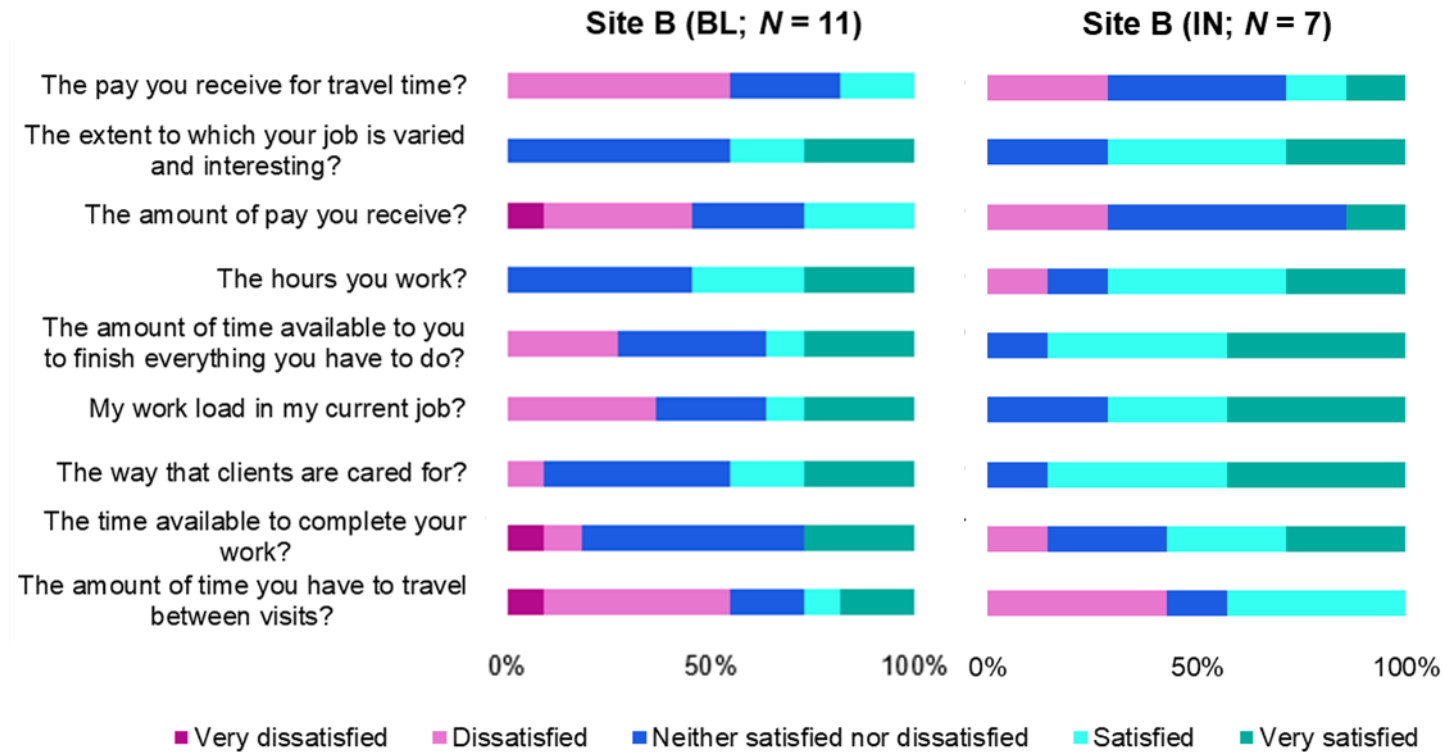


Figure 6: The extent to which clients were satisfied with different elements of their role as a care worker (Site B).



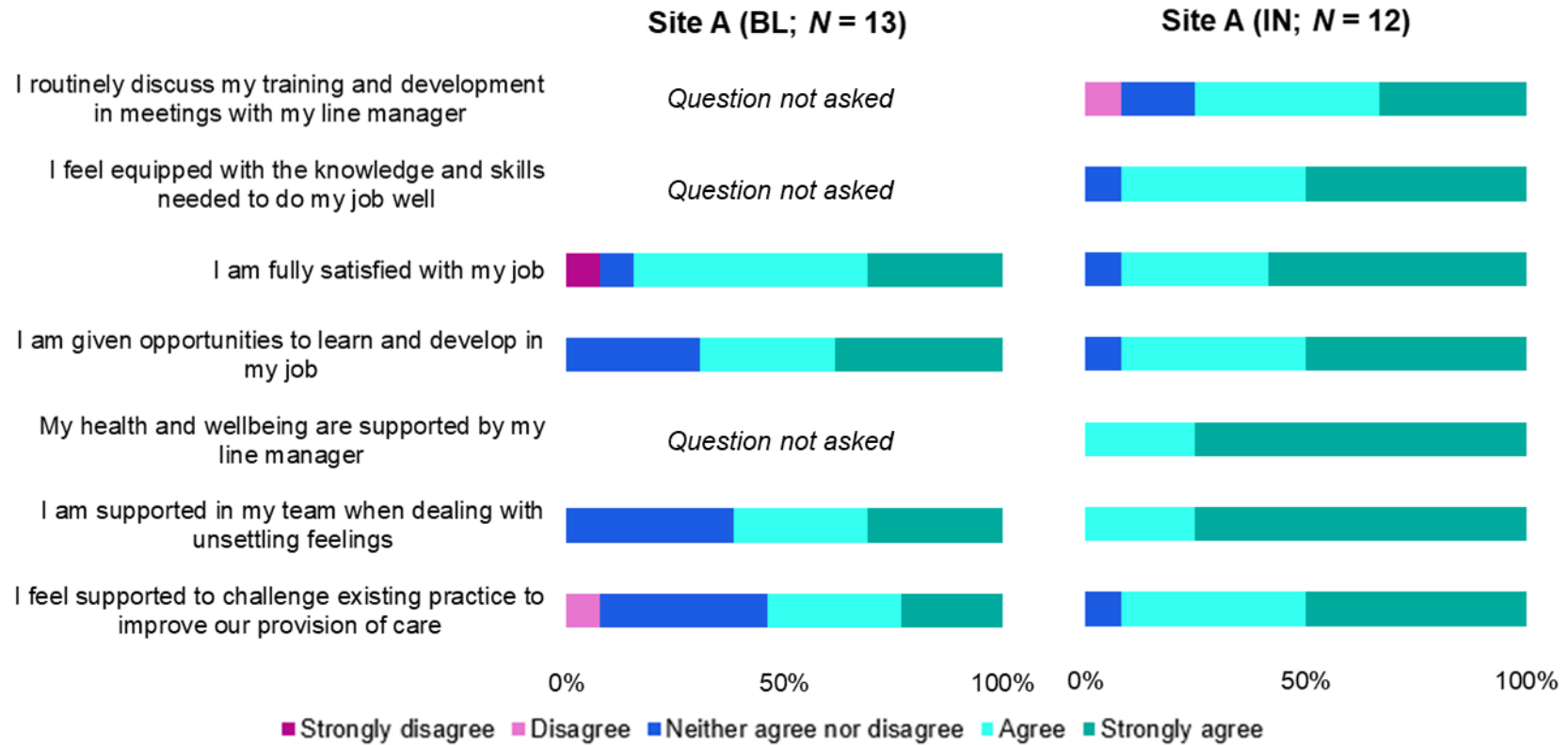


Figure 7: The extent to which clients agreed with different statements relating to their role as a care worker (Site A).

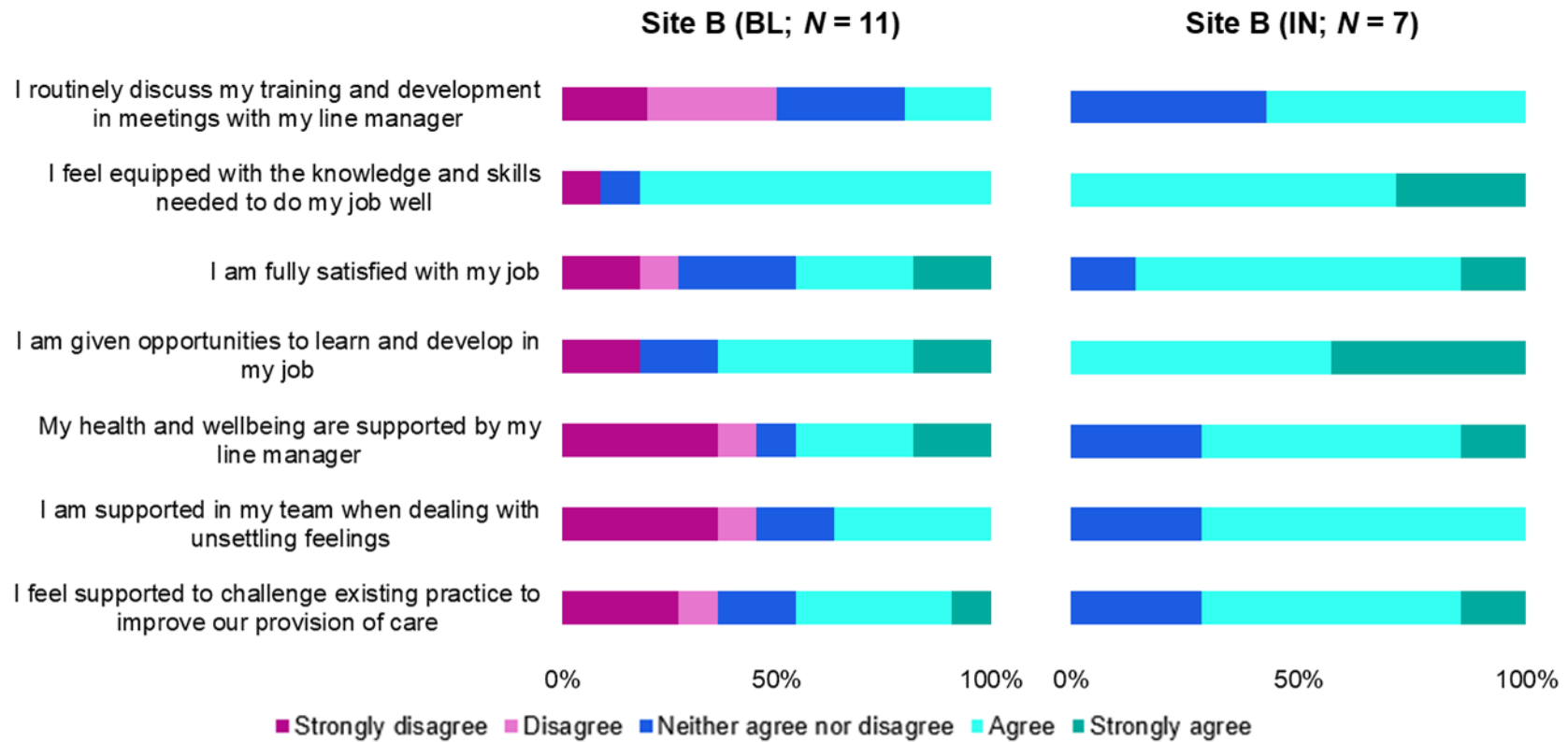


Figure 8: The extent to which clients agreed with different statements relating to their role as a care worker (Site B).

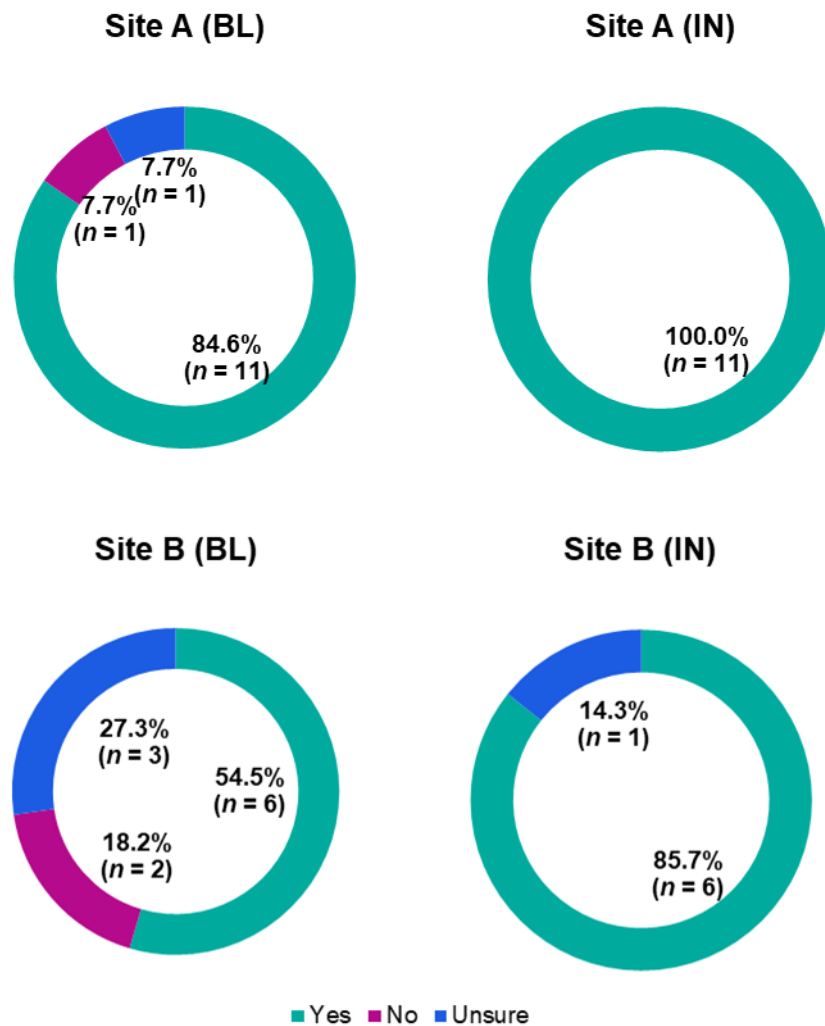
Results presented in Figure 5 for Site A show an overall increase in the number of 'Very satisfied' responses across seven out of all nine job elements from baseline to intervention surveys. The pay respondents receive for travel and the pay they receive in general appear to be the elements which workers are the least satisfied with, for both baseline and intervention periods. While these elements are not directly targeted by the optimisation, the result highlights relatively poor satisfaction in this area. Areas that have improved as a result of the intervention relate to capacity, including job elements such as the time care workers had between visits, workload, and the time available to complete their work.

For Site B, results in Figure 6 show an improvement across most job elements for the intervention period, with substantially more 'Very satisfied' and fewer 'Very dissatisfied' responses in total. Similar to Site A, pay for travel time and pay overall remained elements which scored poorly overall. Similar to Site A, elements relating to capacity appear to feature as key areas for improvement following the optimisation of schedules, including elements such as workload and time to finish everything they need to do, with notable improvement in the way clients are cared for.

Results from the 'agree-with' question for Site A (Figure 7) show improvements in each element when compared with the baseline survey, with an overall higher proportion of 'agree' and 'strongly agree' responses across all statements. For the intervention survey, no 'strongly disagree' responses were recorded, and just one 'disagree' response. Key areas for improvement included feeling supported in dealing with unsettling feelings and feeling supported in challenging the existing practice to improve care provision.

Site B demonstrated significant improvement in survey responses across all areas, with a substantial reduction in the number of 'strongly disagree' and 'disagree' responses in the intervention survey. None of the respondents disagreed with any of the statements, compared with a relatively high number of disagree responses in the baseline. Key areas for improvement included overall job satisfaction, and support with health and wellbeing; however, notable improvements were observed for all questions.

Finally, respondents were asked whether they see themselves working at their current job in a years' time (Figure 9).



**Figure 9: Results from a question on whether respondents see themselves working at their current job in a years' time.**

Results from this question suggest an improvement between the baseline and intervention periods for both Site A and Site B, with a higher proportion of respondents suggesting they do see themselves working at their current job in 12 months' time. For both sites, no respondents indicated that they do not see themselves at their current job in 12 months' time when the question was asked during the intervention period, with one respondent at Site B suggesting they were 'unsure'.

### **Free text responses**

The survey sent to the care workers at Site A and Site B included three free-text questions in the baseline survey and three in the intervention survey. The free-text questions asked are listed below. Please note these findings are based on a smaller sample size, not all workers responded

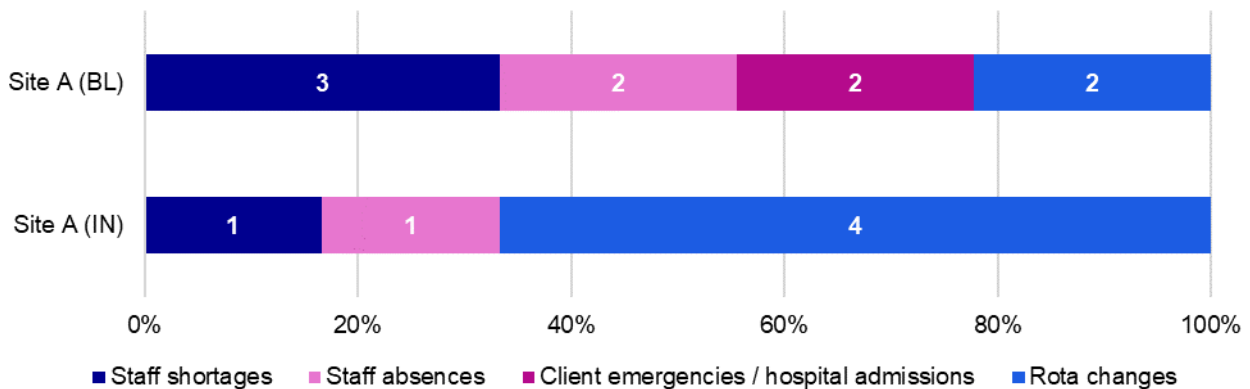
to the free text questions, meaning the results do not represent views from all respondents. This should be considered when interpreting these results.

**Why might your weekly hours of work change? (Baseline and intervention)**

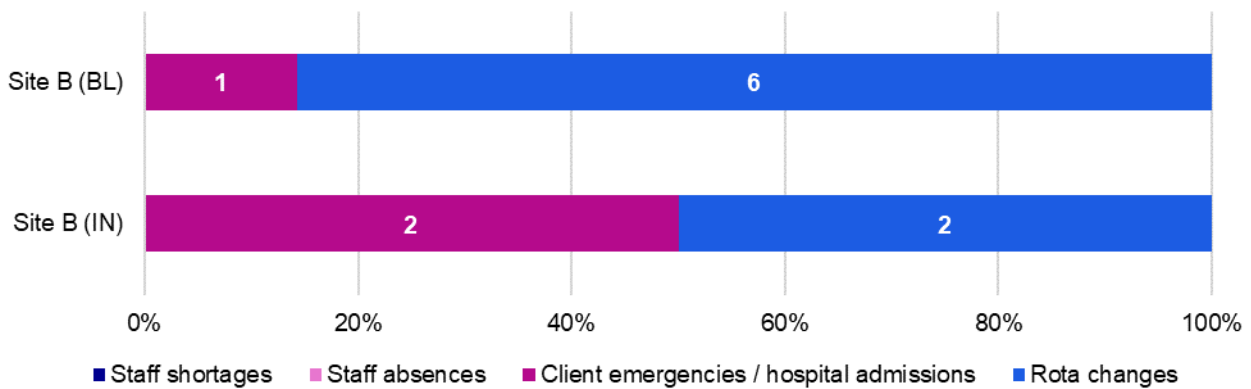
The dominant themes in the Site A baseline survey included staff shortages ( $n = 3$ ), staff absences ( $n = 2$ ), and client emergencies / hospital admissions ( $n = 2$ ). Some staff also noted rota changes as the reason ( $n = 2$ ). Most respondents at Site B noted either planned ( $n = 3$ ) or un-planned ( $n = 3$ ) rota changes, with one response noting client hospital admissions as a reason.

For the intervention period for Site A, respondents noted staff shortages or emergency cover ( $n = 2$ ) or changing rotas ( $n = 4$ ). An overall shift in responses was noted from staff shortage and absence, to changing rotas between the baseline and intervention surveys. For Site B, only four free text responses were received, highlighting planned rota changes ( $n = 2$ ) or client hospital admissions ( $n = 2$ ) as reasons. Fewer unplanned rota changes were reported in the intervention survey.

Results for this question are illustrated for Site A in Figure 10, and Site B in Figure 11.



**Figure 10: Why might your weekly hours of work change? (Site A)**



**Figure 11: Why might your weekly hours of work change? (Site B)**

**What typically happens if you have to take a break longer than 30 minutes? (Baseline)**

For the baseline period, many care workers across both sites noted waiting in their cars ( $n = 6$ , 37.5%). In Site A, one respondent (10%) reported that they have no breaks, and in Site B, two respondents (33%) reported that they have no breaks.

***“Sometimes the time is taken up as I might run over with a client, or I park up and have a break”***

- Survey respondent

**Is there anything else you would like to tell us about your current working patterns that you feel are important to share with us? (Baseline and intervention)**

Four responses to this question in the baseline survey were received for Site A, two of which reported inconsistent work schedules. One other response noted expenses and benefits should be improved. For the intervention survey, four responses were received. Responses noted issues with shift timings ( $n = 1$ ), issues with daily rotas ( $n = 1$ ), and fewer hours to work ( $n = 1$ ). One other response noted their patterns were “satisfying”.

***“Start working hour and finishing time are not best with mothers with children. So this affect working hours for the weeks.”***

- Survey respondent

Site B received five responses to the baseline survey, including two respondents noting they were “very happy” with their work patterns. Two respondents noted issues with travel time/planning, and one noted an issue regarding unpaid client hospital admissions. For the intervention survey, no responses were received from the seven care workers who responded to the survey.

**Have you received any service user / client feedback since either the Procomp implementation or changes to your ways of working / client scheduling? (Intervention)**

This question in the intervention survey received no responses from either Site A or Site B.

## 3.2. Interviews

Collated results from the interviews, using a thematic analysis framework can be found in ‘Appendix H: Thematic analysis framework’.

### Council staff – Commissioning managers

#### *Interim findings*

#### **Current challenges and opportunities**

The challenges in providing care were discussed with interviewees. Notable responses included staff turnover, capacity, the hospital discharge process, and the need to develop a strong relationship between the council, the hospital, and the intermediate care through the hospital discharge pathways.

Opportunities offered by Procomp were discussed, and responses included a reduction in mileage care workers must travel between appointments; better use of capacity in the workforce currently, potentially leading to improved staff well-being and service user care; and finally, from a commissioner perspective, less travel leading to more pay due to more contact time in the working day.

The interviews explored the current communication between the key stakeholders, particularly between commissioners and providers. Both interviewees were happy with the communication levels prior to the intervention being implemented, with this being detailed as a potential enabler for Procomp. The impact since implementation of Procomp was detailed by one response to have enhanced transparency, this is depicted below.

***“[...] it’s more transparent in terms of how they’re planning their routes and how they would look to absorb more people into their rounds from the waiting list. It is a collaborative approach, which has been very positive.”***

- Interviewee

## **Data collection**

A key topic discussed was surrounding the methods of data collection between commissioners and providers. A theme across both interviews highlighted a lack of consistency between some care providers, with data requests not being met, discrepancy over product costs and results, and a lack of transparency regarding funds. This concluded with a desire for a change in the relationship with care providers to be developed, including a suggestion for a system that highlights planned and actual times, with resource available to review the data.

## **Enablers and barriers to implementation**

Interviewees were asked what, from their commissioning perspective, are the key enablers and barriers to successful implementation and the acceptability of Procomp suggestions depicted below.

Enablers were identified as:

- Excellent inter-agency communication, including between local authorities and care providers.
- Strong understanding of processes between agencies.

Barriers were identified as:

- Financial cost.
- Resource availability (staff recruitment and retention).
- Time constraints (adequate time to engage with the project and stakeholders).

## **Changes made and sustainability**

When asked to detail changes that had been made from Procomp's suggestions, the participants explained a change to the way they are monitoring their home care services with greater focus on the environmental impact, as a result of the miles travelled, in addition to strategic changes to workforce aspects, and increased pay for hourly rates.

This led onto discussion regarding the sustainability of these changes, with varying views between the interviewees. One interviewee felt that these changes were sustainable, though they felt as a provider they needed to keep working on the changes, be led by the council, and heavily involve project management. The other felt the changes need to understand the intricacies and the cultural change required to implement the recommendations further.

## **Spread and adoption**

Finally, the interviews discussed the potential wider societal change that Procomp could have in the domiciliary care sector. Both participants felt it has the potential to create a beneficial impact with interest from other parties of the intervention.



### ***Further findings***

Data capture via a council focus group for one of the providers, after an extended period of implementation, led to the following additional findings.

#### **Acceptability**

The focus group were requested to comment on why an estimated four to five providers dropped out of the pilot, resulting in only one provider carrying on with the intervention for this council region. One participant raised that resistance is likely to continue until a clear demonstration of the benefits for the providers can be shown.

It was raised that providers preference for change is through slow and minor adjustments as to not disrupt clients current care plans, as well as having control over the software rather than through a third party. This longer-term approach to change is seen in the quotes below:

***“[Providers]... are very much in favour of evolution, not revolution.”***

***“...we work with them to gradually change and work towards that end goal in the next 7-8 years”***

- Focus group member

#### **Market factors**

Several points were raised regarding how the domiciliary care market is currently, and how it is varying over time. These include that the client population is increasing potentially requiring an increase in supply from providers. In contrast however, it was raised that the care package sizes are dramatically down, approximately a third in size, indicating that this demand is being potentially outweighed by supply.

Finally, it is understood that providers often have electronic care management software (ECM's) in place, although this is not consistent, creating a barrier for analysis and extracting of data consistently. This is detailed to be a barrier for potential implementation of optimisation tools at scale and indicated towards a solution that allows all providers to have control over an ECM.

#### **Care provider staff – Managing directors**

##### ***Interim findings***

##### **Current challenges and opportunities**

The challenges from a provider perspective in the sector were aligned across both interim interviews, addressing staff recruitment and retention primarily and highlighting the method of commissioning.

From an individual provider perspective, the financial challenge of running a smaller domiciliary care business and a lack of understanding at a council level was noted.

### Implementing changes

Both interviewees were asked if they felt Procomp's intervention could create an opportunity to support these challenges through optimised delivery of runs. One provider stated that Procomp could not support the proposed challenges when changes were implemented. The interviewee suggested that this was because Procomp did not:

- Consider staff start and end times.
- Consider the complexity of client needs.
- Allow for staff working specific shifts.
- Allow for continuity of care.

In terms of implementing future changes and Procomp's potential to add value, the provider continued this stance that Procomp's recommendations for rounds were no better than what current staff members can consider and that specific details were not captured in the suggestions proposed by Procomp. They therefore felt no need to make changes.

The other interviewee suggested there was an opportunity for Procomp to add value. Here, they highlighted that having the data available and sharing this with the local authority would help identify the impact of their work and inform the decision-making process for runs.

The following key factors influencing the acceptability of changes were listed:

- **Travel time analysis inaccuracy:** The time taken to travel to the client; for example, parking requirements not being factored.
- **Data processing resource:** The time required to process and extract the data being exceeding resources available.
- **Perceived service user impacts:** Domiciliary care staff managers may be worried about upsetting service users and the detrimental effects that occur from changes to previous care patterns.

With communication to care management not being deemed frequent enough, as well as council reliance on providers to sort the data without support, one suggestion to overcome some of these factors was for greater consistency in the council staff involved in the project.

### Data collection for Procomp's optimisation

When asked how the current method of data collection and process is viewed for the project, (regarding the sharing of data with Procomp to allow for round optimisation), both participants highlighted that current methods are not effective as they are too time consuming. Aspects relating to time consumption included; a lack of data processing skills available at provider level to extract the data, and that at times, to include suggestions from Procomp; and results not being provided in a timely enough manner, two weeks being cited in this case, from one provider's perspective.

## Communication and understanding

Communication effectiveness between the providers and council prior to Procomp's involvement was discussed. This also had varying results, with one provider having a good relationship and the other detailing it as disjointed and inconsistent in terms of quality-of-care planning.

A further mention to the council's missing understanding of provider problems was noted, linking to an example situation depicted below.

***“If there is a problem and social care ask the provider to take more patients and...[provide further remuneration to do so], the provider may struggle due to lack of staff.”***

- Interviewee

## Enablers and barriers to implementation

Interviewees were asked what, from their provider perspective, are the key enablers and barriers to successful implementation and the acceptability of Procomp suggestions, listed below.

Enablers were identified as:

- Procomp having a detailed understanding of client specific needs (training matrix).
- Awareness and understanding from the council of problems faced by the provider.
- An effective data sharing system between the providers and council.

Barriers were identified as:

- Specific care skills required to manage clients with certain healthcare or clinical needs, such as PEG feeding.
- Resource, capacity, and skill constraints for providers to support the project.

## Sustainability and spread and adoption

One provider discussed how greater flexibility with arranging rotas had been introduced and that this was considered a sustainable change. In terms of a wider societal level impact to providing domiciliary care, the interviewee discussed the potential for a more holistic approach. Finally, a reflection was made on how far behind they felt home care is, regarding inclusion of technology, and that a change in culture with commissioners is required to reduce the resistance to wider rollout.

### ***Further findings***

Three further interviews were conducted with providers from each site after a further period of implementation; additional findings are summarised below.

Both providers indicated that the implementation of changes was found to be easier after having been through the process previously. This may be in part from some staff members detailing a benefit from a reduction in travel distances, as well as efficiencies in the data processing required from having done initial setup, although the latter is still raised as a burden.

Insights into the barriers of the programme focused on the impact from changes occurring that alter the carer a client is seeing. This creates a period where the carer needs to learn the routine of the client, which has led to push back from clients and staff regarding making changes. A reflection was noted that this impacts existing clients significantly, whereas new clients are more receptive to changes or are receiving care for the first time. This is reflected in a quote noted below.

***“It would be easier starting on a blank canvas. When you’re working with people that you’ve had for years, change can be hard for them.”***

- Interviewee

It was suggested that if providers had access to the interface to review the rounds without a requirement to provide data, this would assist in the integration of the solution by minimising the time burden, delay in making changes and provide greater control.

No further barriers were expected from providers for integration of the solution into other providers and regions.

### ***Overall interview themes***

Several themes across both sets of interviews with commissioners and providers were identified. Commissioners and providers both highlighted the need for improved communication between the parties. Additionally, financial barriers to implementation were identified, from both a resourcing perspective and in terms of the time commitment required to successfully engage with the project.

Providers raised the importance of continuity of care for both staff and clients as a key determinant of acceptability for these parties.

From a provider-specific lens, a greater understanding from Procomp into the detail of the staff training matrix and skill requirements to deliver care to certain clients was noted as a key point. This was also noted by commissioners.

Implementation of changes is viewed to become easier over time, with reflection that expected benefits have been realised, if not always visible within the data, as detailed in the quote below.

***“[We] have seen a reduction in what they would expect to see with the travel time and things like that. ... If there hasn’t been, there’s a reason for it. ...it’s done what it’s supposed to have done.”***

- Interviewee

### 3.3. Quantitative insights

This section presents results from the analysis of appointment schedules, with care worker travel distances incorporated from the analysis of a distance matrix provided by Procomp.

Table 2 shows the average number of care workers and clients at each site per month, in addition to the average number of appointments and trips taken per month, and the average contact time per client for baseline and intervention periods. Trips describe the recorded travel by care workers to appointments, which is less than the number of appointments due to some travel not being included in the data. More detail on this can be found in the Limitations section under Travel distance analysis.

These results suggest how many care workers and how many clients are being seen each month at the sites and provide an indication of how care package sizes are changing over time.

**Table 2: Average number of care workers and clients at each site per month.**

	Site A (baseline)	Site A (intervention)	Site B (baseline)	Site B (intervention)
Avg. care workers per month	62	57	33	32
Avg. clients per month	97	105	60	63
Avg. number of appointments per month (all care workers)	9,643	9,426	3,713	3,811
Avg. number of recorded trips per month (all care workers)	8,668	9,066*	3,556	3,613

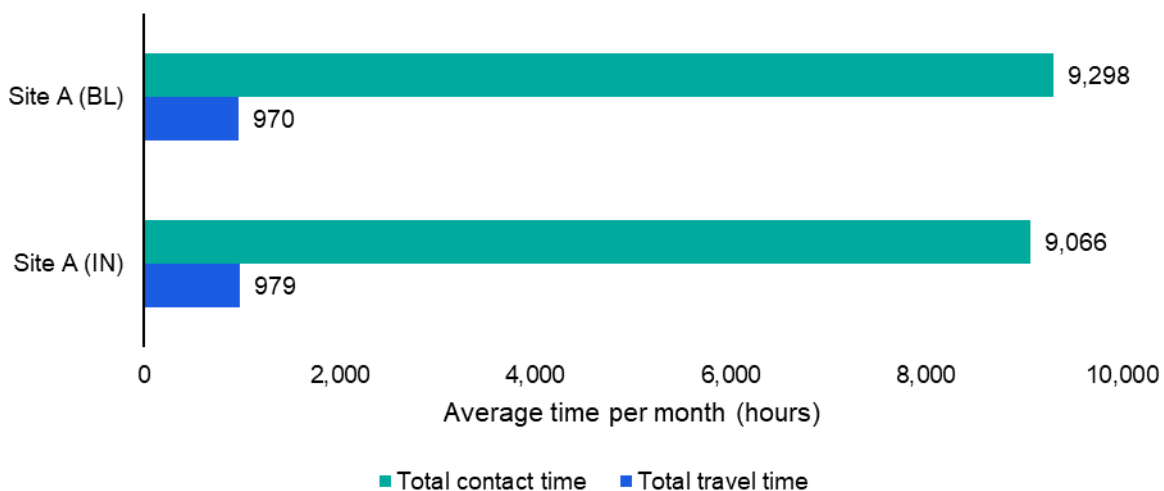
	Site A (baseline)	Site A (intervention)	Site B (baseline)	Site B (intervention)
Avg. contact time per client per month (hours)	96.0	89.6*	53.6	49.7

\*Excludes September 2023 due to only 2 weeks of data.

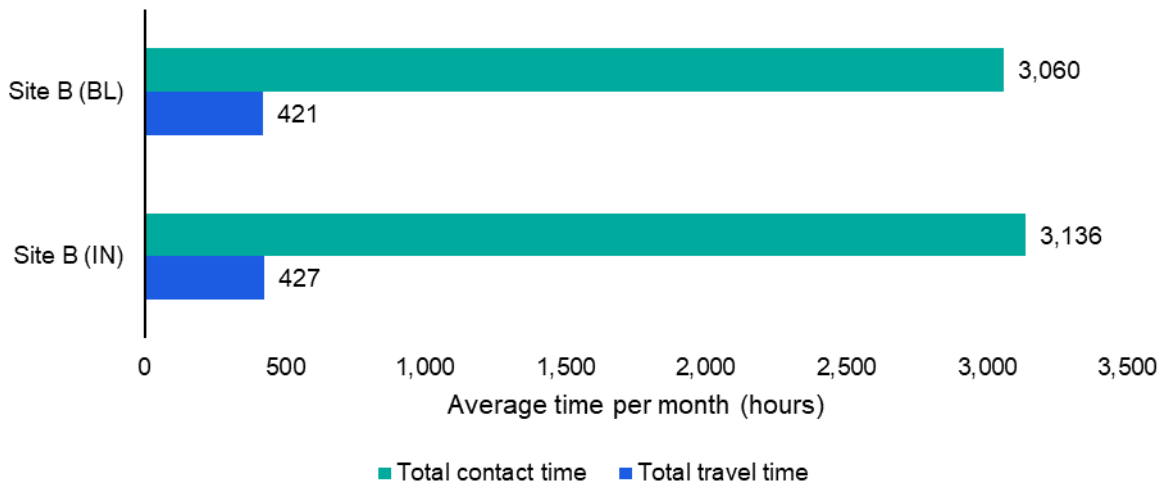
Results in Table 2 show that Site A had fewer distinct care workers and more distinct clients per month. The greater number of clients being seen in the intervention period for Site A is indicative of expansion across a wider client group. Site B had a similar number of distinct care workers, along with a slightly increased number of clients seen each month, suggesting the same level of expansion is not occurring at Site B. The client cohort between the two periods is not consistent, meaning changes may be a result of changes in the profile of clients receiving services.

Additionally, Table 2 shows that for Site A, there had been an increase in the average number of trips taking place by care workers, while there has been a reduction in the average contact hours per client each month, suggesting care package sizes are getting smaller, while the number of trips required is increasing. Site B also demonstrated a similar number of trips per month while the average contact hours per client had decreased during the intervention period.

Figure 12 and Figure 13 show the total contact time and total travel time, presented as the average per month during each period, for Site A and Site B respectively. Both total contact time and total travel time are presented together to understand the relationship between the two metrics.



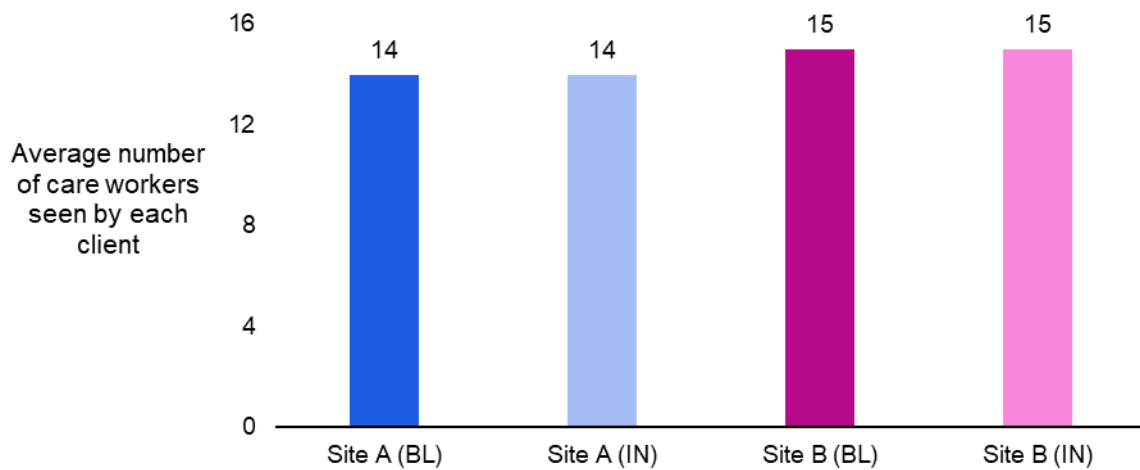
**Figure 12: Total contact time and total travel time presented as an average number of hours per month (Site A).**



**Figure 13: Total contact time and total travel time presented as an average number of hours per month (Site B).**

Results from Figure 12 for Site A show a decrease in contact time (-2.49%) along with a slight increase in travel time (0.90%). This contact time remained relatively high and travel time relatively low, considering the decrease in number of care workers and the increase in number of new clients following expansion across a wider area. Figure 13 for Site B indicates a slight increase in contact time (2.51%) and travel time (1.54%) between the two periods. Procomp is more likely to include travel time in schedules, which would decrease reported contact time; however, only a slight increase was observed.

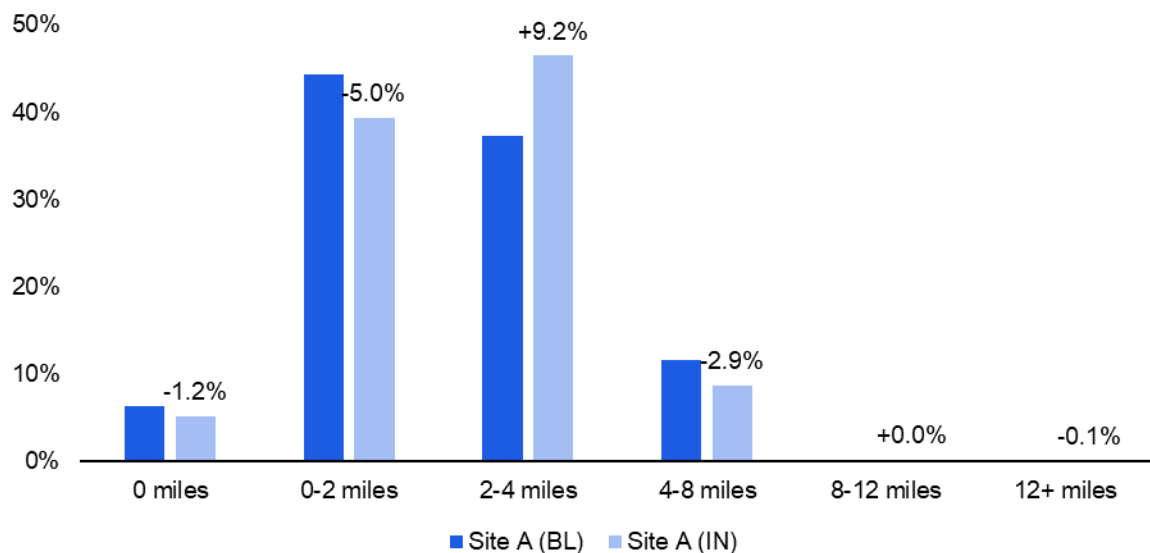
Care continuity is estimated by analysing the number of care workers seen by each client on average during each period. To enable an appropriate comparison, data was taken from the latest full 5 months of each period. Patients who had less than 10 visits were excluded on the basis of averages being disproportionately affected. Results from this analysis are presented in Figure 14.



**Figure 14: Average number of care workers seen by each client, by site (BL and IN).**

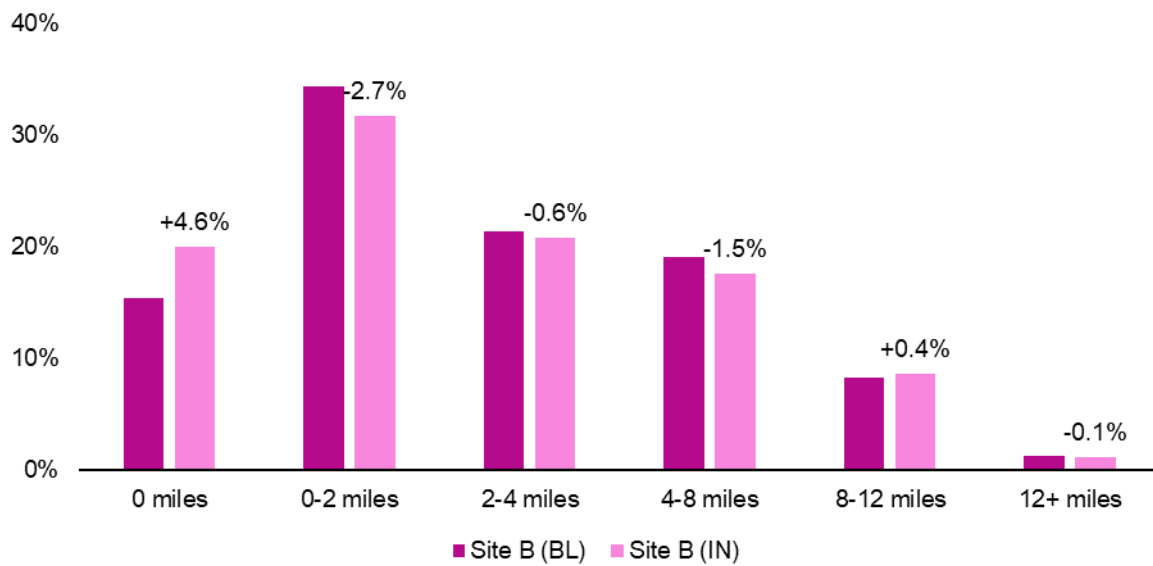
Results presented in Figure 14 suggest no change in the number of care workers were seen by clients at Site A and Site B. Clients at both Site A and Site B saw the same number of care workers during the intervention period compared with the last five months of the baseline period.

The distribution of travel distances between 0 miles and over 12 miles was analysed and is presented in Figure 15 for Site A and Figure 16 for Site B.



**Figure 15: Distribution of distances travelled to appointments by care workers at Site A.**

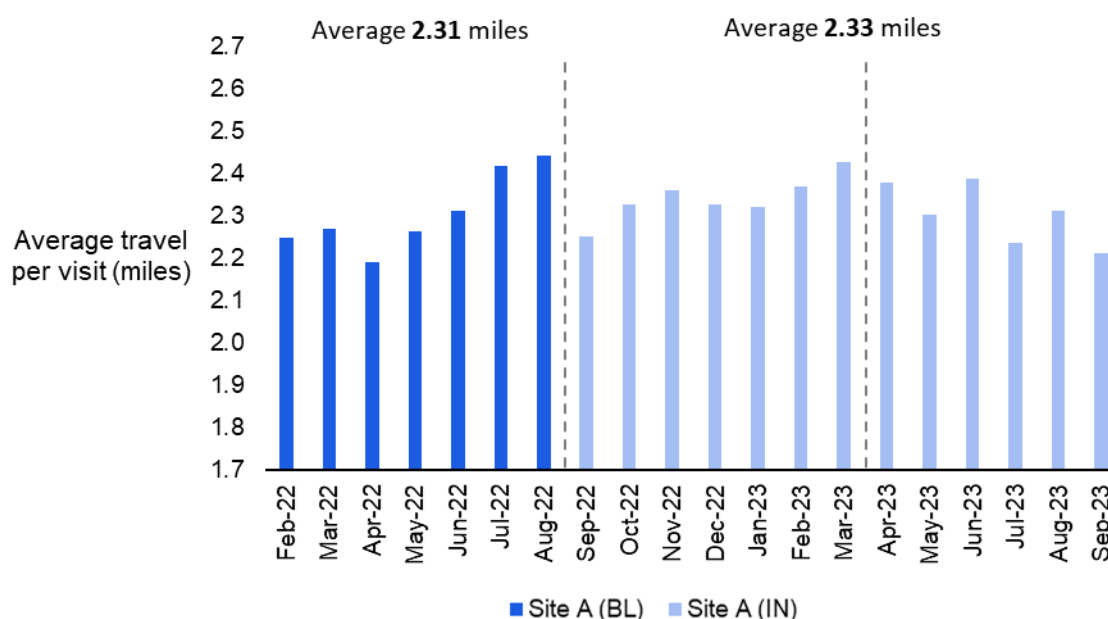




**Figure 16: Distribution of distances travelled to appointments by care workers at Site B.**

Figure 15 shows a higher proportion of travel distances between 2-4 miles (+9.2%) during the intervention period, with a shift observed from 0-2 miles to 2-4 miles, suggesting proportionally a higher number of long trips for care workers. Figure 16 shows a higher proportion of travel distances at 0 miles (+4.6%) for the intervention period, with the most substantial shift from 0-2 to 0 miles. For Site B, this indicates a higher proportion of appointments required no little to no travelling due to schedule changes.

The average distance travelled to each appointment per month was analysed for both sites to present a trend over time of average travel distances. Results from this analysis are presented in Figure 17 for Site A. The dotted lines represent the times when schedules were optimised.

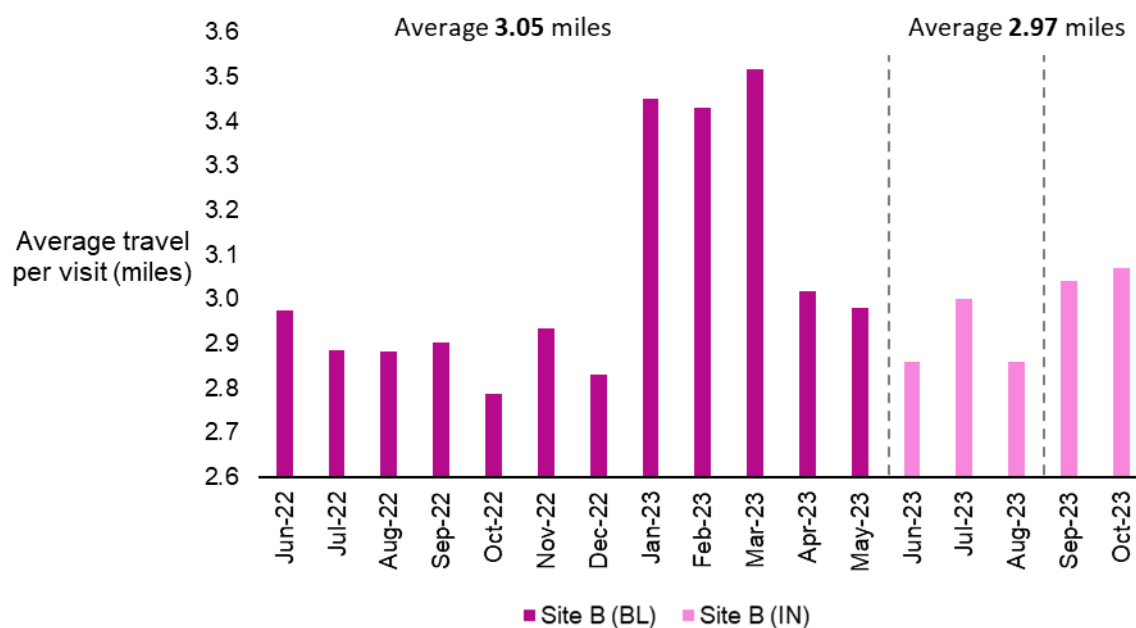


**Figure 17: Average distance travelled to each visit per month by care workers at Site A.**

Site A demonstrated a sharp decline in average distance travelled from August 2022 to September 2022, after a trend showing travel distances increasing during the baseline period. Average travel distances then increase steadily through to March 2023, after which another round of optimisation occurred in April 2023, resulting in the overall decline in average distances until September 2023. Distances decreased after changes were made and appear to have gradually reverted back to their original state following turnover of care packages and staff over the following months. The effect of the intervention dissolved over time until new rounds were introduced.

The resulting average across the whole baseline and intervention periods was 2.31 and 2.33 miles respectively, which was similar overall. Given the trend of increasing travel distances before changes to schedules were implemented, and Figure 16 suggesting a higher distribution of further travel distances, it could be argued that the average travel distances would likely be greater between September 2022 and September 2023 if it wasn't for the schedule changes recommended by Procomp.

Results for Site B are presented in Figure 18. The dotted lines represent the times when schedules were optimised.



**Figure 18: Average distance travelled to each visit per month by care workers at Site B.**

Results for Site B show a reduction in the average distance travelled for the intervention period when comparing with the last 5 months of the baseline period, with an average of 3.28 miles between January 2022 and May 2022, and 2.97 miles between June 2023 and October 2023. When considering the same time of the year, however, June 2022 to October 2022 has an average distance of 2.89 miles, compared with 2.97 miles across the same months of 2023. Results for Site B also indicate relatively high levels of variation between months, with no clear visible effect from seasonality. Overall, there is not enough intervention data to confidently suggest that there has been an impact, though initial results appear positive when considering the averages between the two periods.

Insights from Table 2 showing expansion across a broader client group, and Figure 15 showing a higher proportion of longer travel distances, suggested that care workers at Site A may have had to travel further to appointments during the intervention period. To investigate this further, analysis was conducted on the distance matrix provided by Procomp, to obtain the average distance between the different nodes (representing anonymised client postcodes) within the matrix. This analysis provides an estimate for how far apart the clients' postcodes are from each other, with a greater distance indicating a client group which are overall spread across a wider geographical area. Results from this analysis are presented in Table 3. More detail on the distance matrix and how it was used to analyse schedules is located in the Quantitative data collection section of the Methodology.

**Table 3: Average distance between client postcodes for Site A.**

	Site A (BL)	Site A (IN)
Average distance between all client postcodes	8.94 km	9.68 km (+8.3%)

Results from Table 3 suggest that clients seen during the intervention period were on average more spaced out from each other than those seen during the baseline period. As a result, it is likely that care workers were required to travel further between appointments during the intervention period than for the baseline period.

### 3.4. Health economic modelling

This section highlights the findings of the cost-benefit analysis to identify the potential economic value of Procomp, as implemented in the Domiciliary Care Workforce Programme.

#### **Scenario 1 results**

This section represents the results for Scenario 1, which was built utilising data from Site A only. The model provides estimates of the costs and benefits under each scenario over their respective periods. Table 4 depicts the results for Scenario 1.



**Table 4: Scenario 1 economic modelling results. Please note that the figures below have been rounded to the nearest GBP for presentation and as such, totals may not sum.**

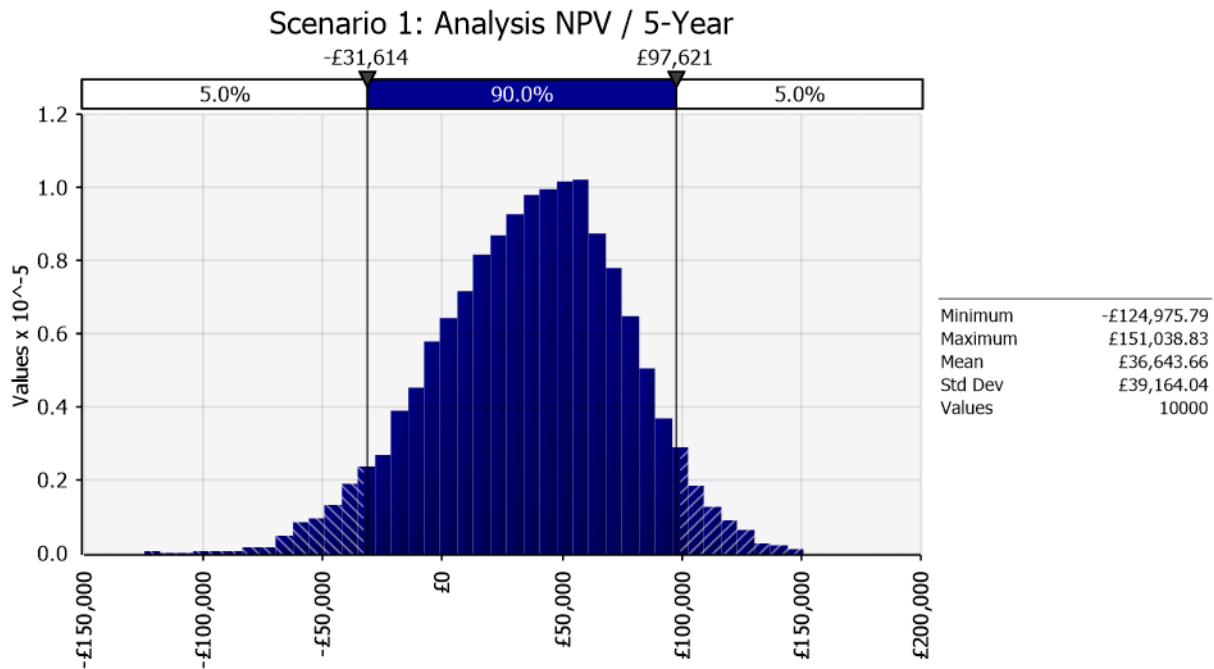
<b>Site A only results</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
<b>Benefits</b>						
1.1 Reduction in travel distance	-£1,573.3	-£1,505.7	-£1,440.7	-£1,387.0	-£1,341.3	<b>-£7,247.9</b>
1.2 Increased care packages delivered	£12,315.0	£12,070.7	£11,902.8	£11,709.4	£11,468.1	<b>£59,466.1</b>
1.3 Improved staff retention	£2,007.4	£1,961.5	£1,928.2	£1,890.9	£1,846.2	<b>£9,634.2</b>
<b>Total benefits</b>	<b>£12,749.1</b>	<b>£12,526.5</b>	<b>12,390.3</b>	<b>£12,213.4</b>	<b>£11,973.1</b>	<b>£61,852.3</b>
<b>Costs</b>						
1.1 Council staff training and maintenance costs	£9,836.6	£-	£-	£-	£-	<b>£9,836.6</b>
1.2 Project cost	£9,200.0	£-	£-	£-	£-	<b>£9,200.0</b>



<b>Site A only results</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
1.3 Provider staff implementation and maintenance costs	£345.1	£338.3	£333.6	£328.1	£321.4	<b>£1,666.5</b>
<b>Total costs</b>	<b>£19,381.72</b>	<b>£338.27</b>	<b>£333.57</b>	<b>£328.15</b>	<b>£321.39</b>	<b>£20,703.09</b>
<b>Net Present Value (NPV) and Benefit-Cost Ratio (BCR)</b>						
<b>Total NPV</b>	-£6,632.6	£12,188.2	£12,056.7	£11,885.2	£11,651.7	<b>£41,149</b>
<b>Total BCR</b>	-	-	-	-	-	<b>2.99</b>

## Sensitivity analysis

The sensitivity analysis assessed how various sources of uncertainty within the model contributed to the model's overall uncertainty. Figure 19 depicts the NPV sensitivity analysis using @RISK software to represent the most likely outcomes as well as the potential range of results at a 90% confidence interval based on 10,000 simulations.



**Figure 19: NPV sensitivity analysis for Scenario 1.**

The sensitivity analysis for Scenario 1 indicated that, within a 90% confidence interval, the modelled net benefit falls between -£31.61k and £97.62k, with an expected value (in other words, a mean) of £36.64k. The 90% confidence interval range of £129.24k is representative of the uncertainty in the assumptions used for the modelling.

The tornado chart in Figure 20 illustrates the individual impact of each variable input on the net benefit. Each comparison fixes all other assumptions to the expected value and uses the minimum/maximum values of the highlighted input to show the overall impact on the net benefit. This has been completed for the Scenario 1 analysis to identify which influencing factors affect the value of Procomp the most. The results depicted that the baseline and intervention average travel distance per trip had the greatest impact on the output.

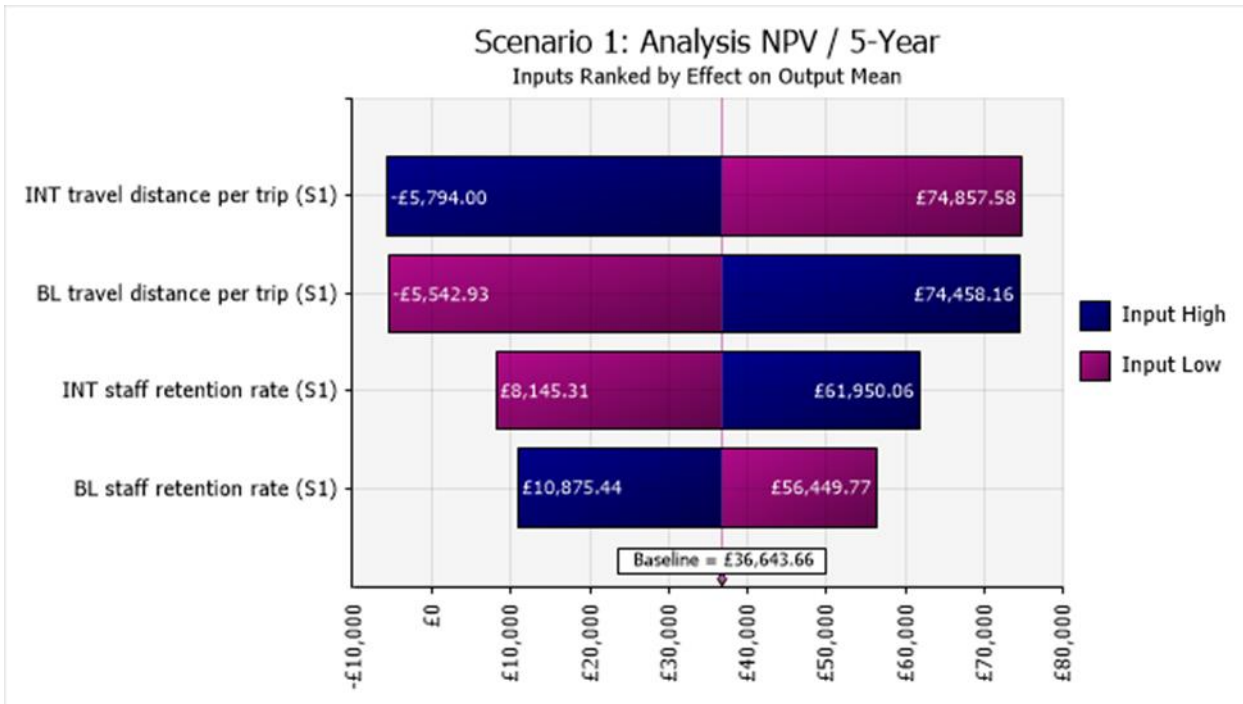


Figure 20: Tornado chart depicting key factors which influence the Scenario 1 NPV value. The key indicates the expected change in outcomes when each factor is changed according to the minimum and maximum within the stipulated sensitivity range. The baseline figure at the bottom of the chart is representative of the output mean. BL refers to the baseline period, INT refers to the intervention period.





## Scenario 2 results

Table 5 depicts the results for Scenario 2.

**Table 5: Scenario 2 economic modelling results. Please note that the figures below have been rounded to the nearest GBP for presentation and as such, totals may not sum. These values have a GDP deflator and discounting applied.**

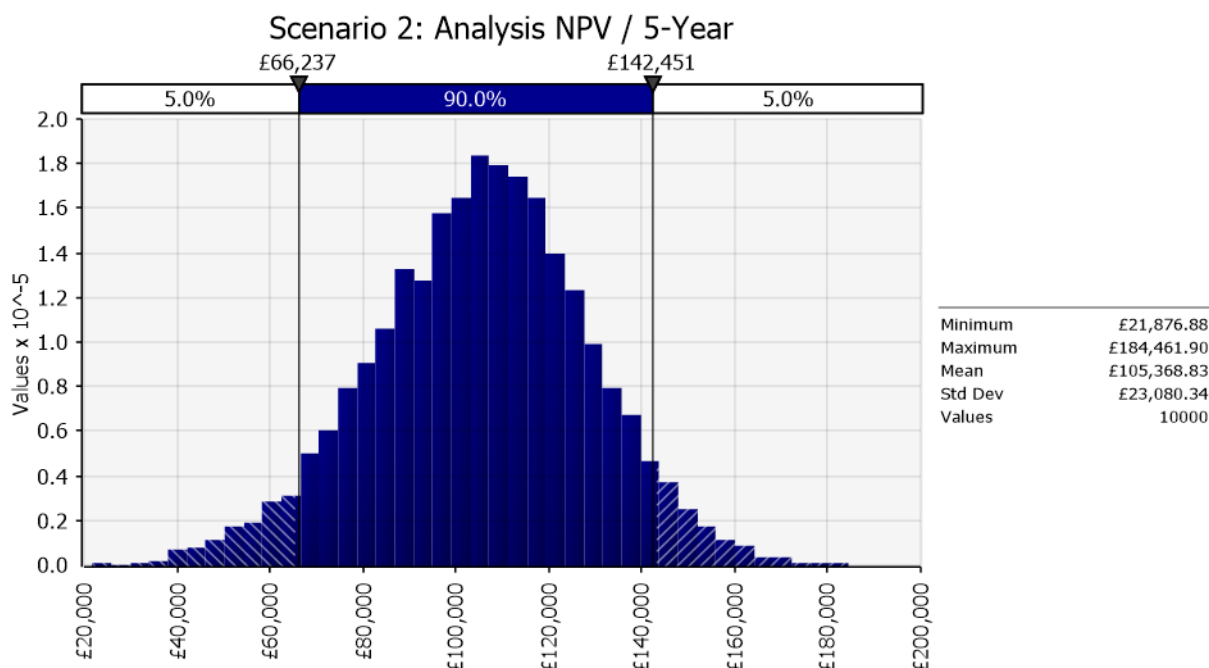
<b>Site A and B results</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
<b>Benefits</b>						
1.1 Reduction in travel distance	£427.3	£409.0	£391.3	£376.7	£364.3	<b>£1,968.6</b>
1.2 Increased care packages delivered	£28,265.0	£27,704.4	£27,319.0	£26,875.1	£26,321.4	<b>£136,484.9</b>
1.3 Improved staff retention	£2,007.4	£1,961.5	£1,928.2	£1,890.9	£1,846.2	<b>£9,634.2</b>
<b>Total benefits</b>	<b>£30,699.7</b>	<b>£30,074.8</b>	<b>£29,638.5</b>	<b>£29,142.8</b>	<b>£28,531.9</b>	<b>£148,087.67</b>
<b>Costs</b>						
1.1 Council staff training and maintenance costs	£19,673.2	£-	£-	£-	£-	<b>£13,503.3</b>



<b>Site A and B results</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
1.2 Project cost	£18,400.0	£-	£-	£-	£-	<b>£18,400.0</b>
1.3 Provider staff implementation and maintenance costs	£690.2	£676.5	£667.1	£656.3	£642.8	<b>£3,333.0</b>
<b>Total costs</b>	<b>£38,763.43</b>	<b>£676.5</b>	<b>£667.1</b>	<b>£656.3</b>	<b>£642.8</b>	<b>£41,406.18</b>
<b>NPV and BCR</b>						
<b>Total NPV</b>	-£8,063.7	£29,398.3	£28,971.4	£28,486.5	£27,889.1	<b>£106,681</b>
<b>Total BCR</b>	-	-	-	-	-	<b>3.58</b>

## Sensitivity analysis

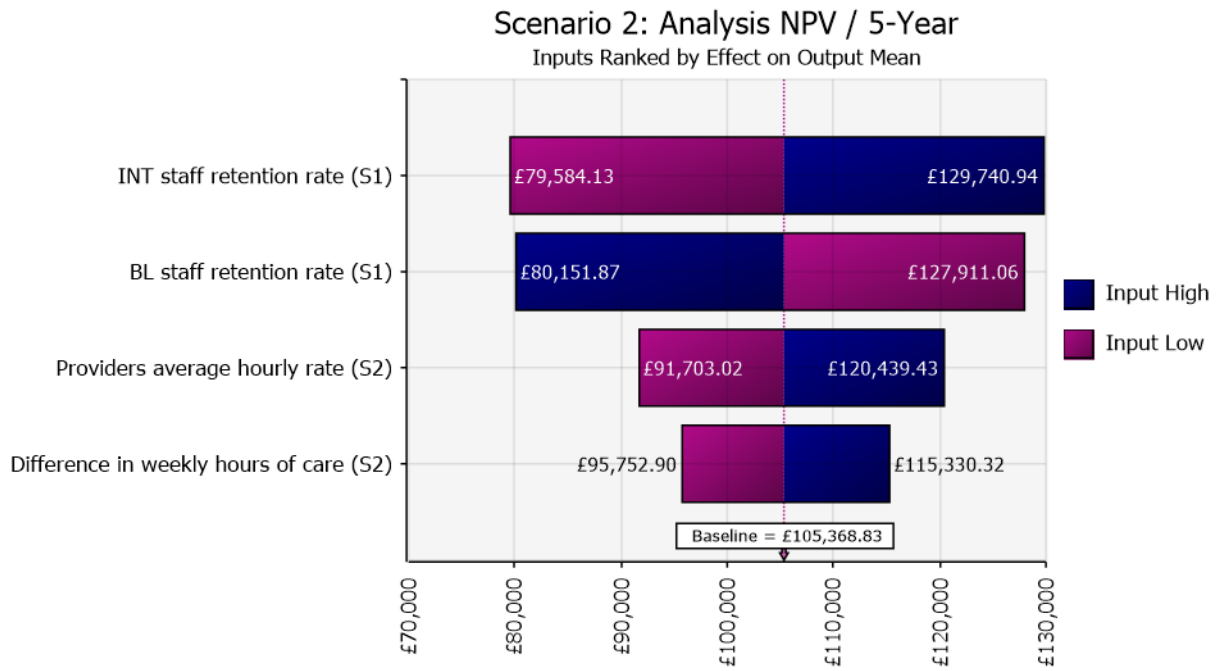
Figure 21 depicts the NPV sensitivity analysis using @RISK software to represent the most likely outcomes as well as the potential range of results at a 90% confidence interval based on 10,000 simulations.



**Figure 21: NPV sensitivity analysis for Scenario 2.**

The sensitivity analysis for Scenario 2 indicated that, within a 90% confidence interval, the modelled net benefit falls between £66.24k and £142.45k, with an expected value (in other words, a mean) of £105.37k. The 90% confidence interval range of £76.21k is representative of the uncertainty in the assumptions used for the modelling.

The tornado chart in Figure 22 illustrates the individual impact of each variable input on the NPV. Each comparison fixes all other assumptions to the expected value and uses the minimum/maximum values of the highlighted input to show the overall impact on the NPV. This has been completed for the Scenario 2 analysis to identify which influencing factors affect the value of Procomp the most. The results depicted that the baseline and intervention retention rate (from Site A only), had the greatest impact on the output.



**Figure 22: Tornado chart depicting key factors which influence the Scenario 2 NPV value. The key indicates the expected change in outcomes when each factor is changed according to the minimum and maximum within the stipulated sensitivity range. The baseline figure is representative of the output mean.**



## Scenario 3 results

Table 6 depicts the results for Scenario 3.

**Table 6: Scenario 3 economic modelling results. Please note that the figures below have been rounded to the nearest GBP for presentation and as such, totals may not sum. These values have a GDP deflator and discounting applied.**

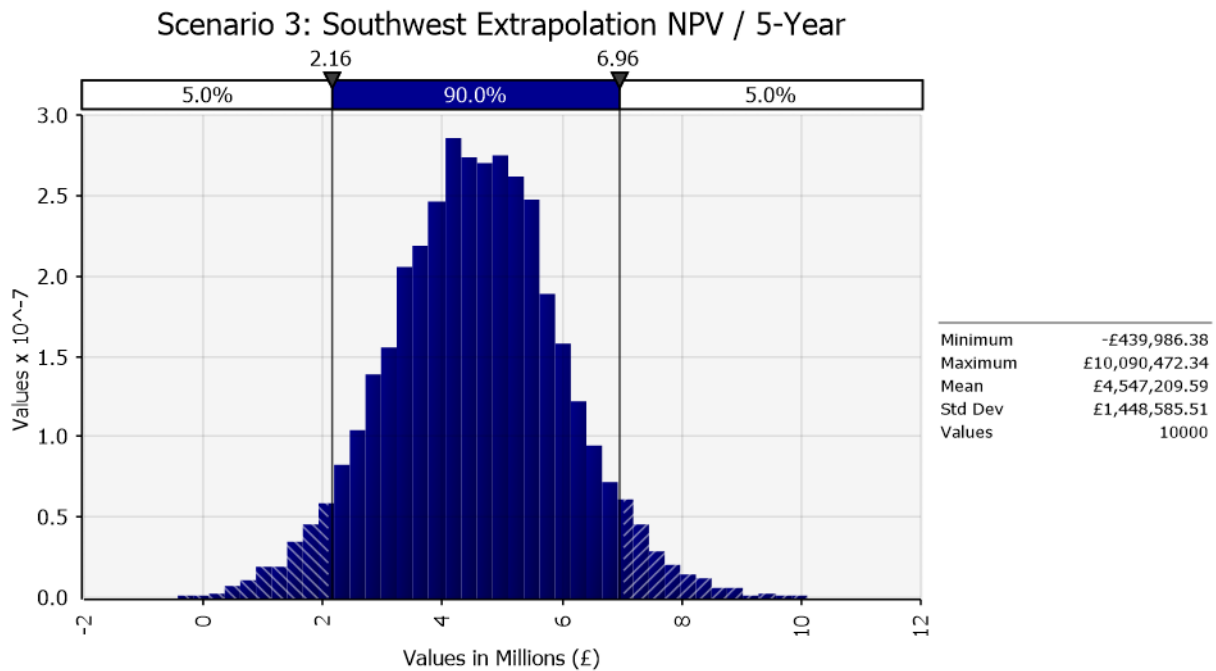
<b>South West extrapolation</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
<b>Benefits</b>						
1.1 Reduction in travel distance	£17,673	£16,914	£16,183	£15,580	£15,067	<b>£81,416</b>
1.2 Increased care packages delivered	£1,237,748	£1,213,200	£1,196,323	£1,176,884	£1,152,635	<b>£5,976,790</b>
1.3 Improved staff retention	£124,532	£121,683	£119,618	£117,309	£114,535	<b>£597,677</b>
<b>Total benefits</b>	<b>£1,379,953</b>	<b>£1,351,797</b>	<b>£1,332,124</b>	<b>£1,309,773</b>	<b>£1,282,236</b>	<b>£6,655,883</b>
<b>Costs</b>						
1.1 Council staff training and maintenance costs	£179,625	£-	£-	£-	£-	<b>£179,625</b>



<b>South West extrapolation</b>	<b>Year 1</b> 2023/2024	<b>Year 2</b> 2024/2025	<b>Year 3</b> 2025/2026	<b>Year 4</b> 2026/2027	<b>Year 5</b> 2027/2028	<b>Total</b> 2023/24 – 2027/28
1.2 Project cost	£1,598,074	£-	£-	£-	£-	<b>£1,598,074</b>
1.3 Provider staff implementation and maintenance costs	£52,129	£51,095	£50,384	£49,566	£48,544	<b>£251,718</b>
<b>Total costs</b>	<b>£1,829,828</b>	<b>£51,095</b>	<b>£50,384</b>	<b>£49,566</b>	<b>£48,544</b>	<b>£2,029,417</b>
<b>NPV and BCR</b>						
<b>Total NPV</b>	-£449,874.6	£1,300,701.9	£1,281,740.0	£1,260,207.1	£1,233,691.9	<b>£4,626,466</b>
<b>Total BCR</b>	-	-	-	-	-	<b>3.28</b>

## Sensitivity analysis

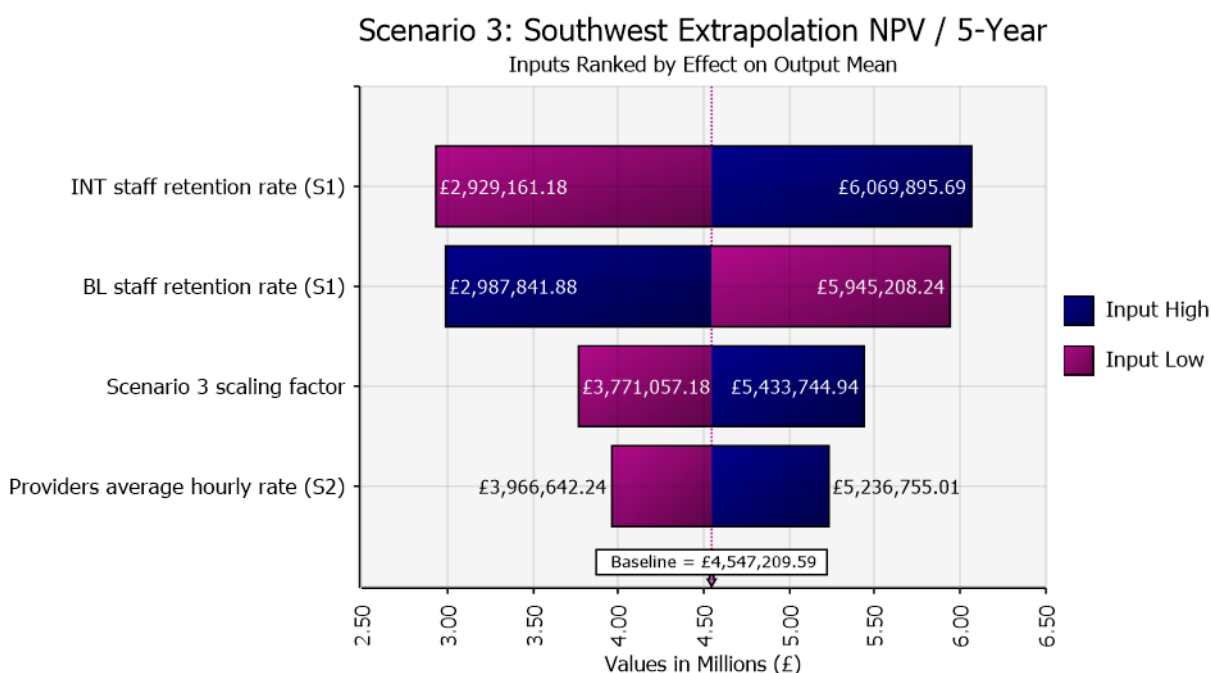
Figure 23 depicts the net benefit sensitivity analysis using @RISK software to represent the most likely outcomes as well as the potential range of results at a 90% confidence interval based on 10,000 simulations.



**Figure 23: NPV sensitivity analysis for Scenario 3.**

The sensitivity analysis for Scenario 3 indicated that, within a 90% confidence interval, the modelled net benefit falls between £2.16m and £6.96m, with an expected value (in other words, a mean) of £4.55m. The 90% confidence interval range of £4.80m is representative of the uncertainty in the assumptions used for the modelling.

The tornado chart in Figure 24 illustrates the individual impact of each variable input on the NPV. Each comparison fixes all other assumptions to the expected value and uses the minimum/maximum values of the highlighted input to show the overall impact on the NPV. This has been completed for the Scenario 3 analysis to identify which influencing factors affect the value of Procomp the most. The results similarly to scenario 2, depicted that the baseline and intervention retention rate had the greatest impact on the output. Additionally, the scaling factor applied also had a large bearing on the outputs as would be expected.



**Figure 24: Tornado chart depicting key factors which influence the Scenario 3 NPV value. The key indicates the expected change in outcomes when each factor is changed according to the minimum and maximum within the stipulated sensitivity range. The baseline figure is representative of the output mean.**

## Health economic results summary:

### 1. Net benefit per client seen (Scenario 1, Year 1):

There were 222 distinct clients seen during the intervention period for Site A. If you consider the year 1 total benefits of £12,749.1 there was a net benefit per client of £57.42. Regarding the year 1 NPV of -£6,632.6, this would produce a per client NPV of -£29.88.

### 2. Costing and benefits structure (All scenarios):

Years two to five produce a greater NPV due to the lower costs expected from no further council time requirements and the one-off Procomp costing structure. Benefits are primarily derived from the increase in care packages delivered, accounting for 96% of the total benefits in scenario 1.

### 3. Sensitivity analyses highlighted the importance of baseline and intervention retention rates and travel distances on NPV:

Sensitivity analyses underscored the critical role of baseline and intervention care hours in shaping the NPV. This emphasises the need for a nuanced understanding of the initial care context and the intervention's impact on retention rates in assessing economic outcomes.

### 4. All scenarios exhibit cost-effectiveness, with BCR above 1:

Across all scenarios, the BCR is greater than one across the five year period, indicating effectiveness, with positive NPV's. This implies that, from a financial perspective, the economic



benefits derived from Procomp implementation do outweigh the incurred costs. The sensitivity analyses ranges for each scenario indicates variability in estimated results from the assumptions and sources used.

5. After review, staff retention results from Site B were removed, previously these had significantly contributed to unfavourable financial outcomes within scenarios 2 & 3:

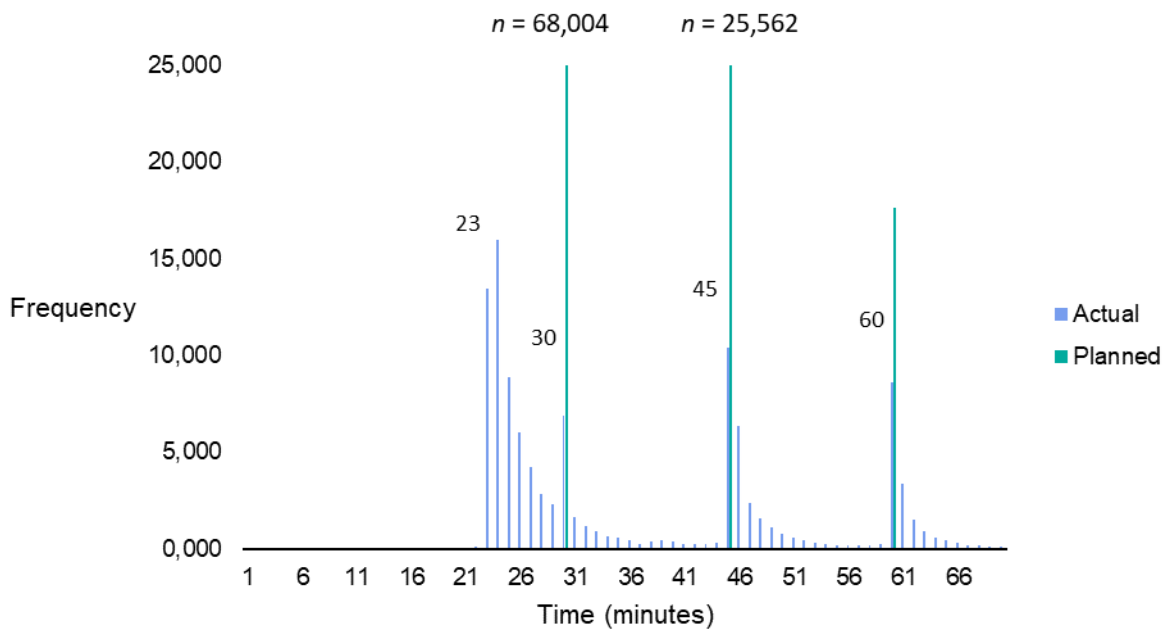
The adverse effects on staff retention in Site B had emerged as a prominent factor contributing to unfavourable financial outcomes seen for scenario 2 & 3 which were unexpected. Although now removed, this highlights the impact external changing factors can have on the real-world results collected as part of this evaluation.

## 4. Limitations

While this report presents various analyses and resulting insights, it is important to acknowledge the limitations that may impact the robustness of the findings. As with any study, contextual and external factors may influence the applicability of the conclusions, and therefore, consideration of these limitations is essential when interpreting and applying the results presented in this report.

### **Visit length distribution**

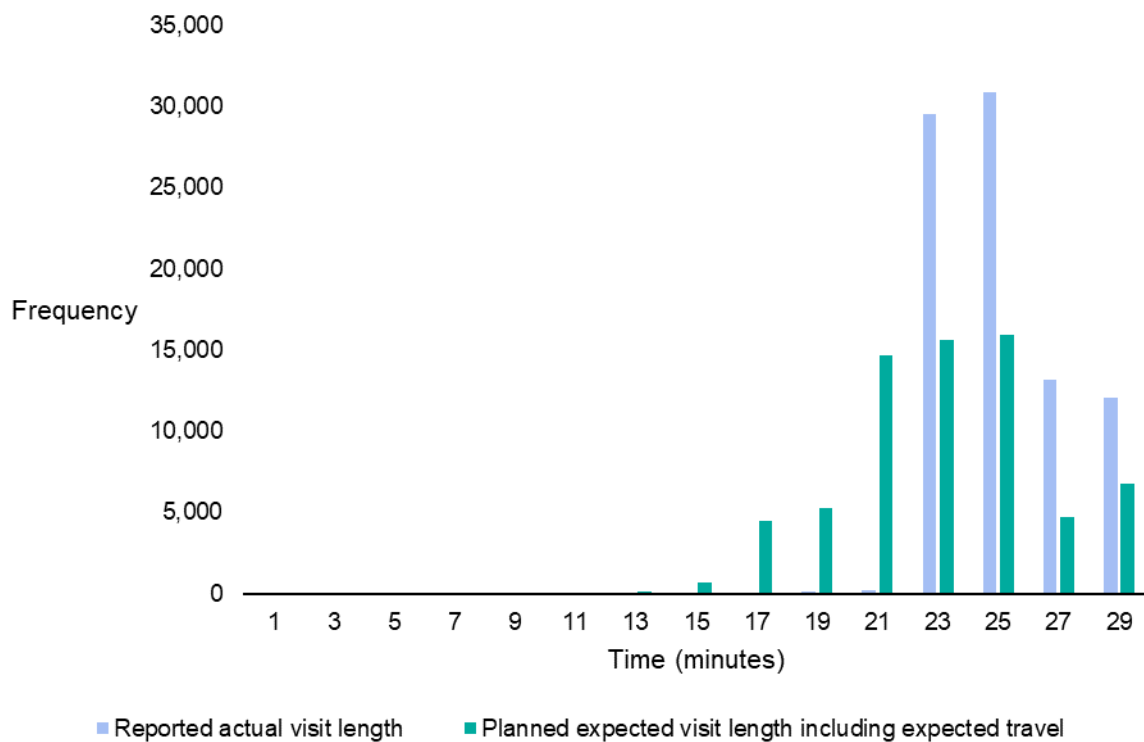
The distribution of reported actual visit lengths presented in Figure 25 for Site A shows large peaks at 23, 30, 45, and 60 minutes, with a distribution of smaller peaks trailing after these times. This data shows a negligible number of visits that were less than 23 minutes in length, suggesting that these visits were rounded up to 23 minutes. A similar pattern can be seen for visits less than 30, 45, and 60 minutes, where reported actual times may have been rounded up. Site B did not provide data on reported actual visit lengths, meaning evidence of this is only available for Site A.



**Figure 25: Distribution of planned and reported actual visit lengths for care workers at Site A. The number of appointments recorded at each time is indicated by the frequency.**

These patterns suggest reported visit times may not be accurate compared to actual visit lengths, which may impact some of the metrics by over-inflating visit lengths. It is important to acknowledge that this is not an issue exclusive to one provider, rather, seems to be common practice in the industry which poses challenges for the analysis of schedules. Findings for this evaluation, however, are unlikely to be significantly impacted, as this effect is observed for both the baseline and intervention time periods, meaning the pre- and post-comparison remains valid.

This variation can also be illustrated by estimating the visit length utilising the planned times for Site A, after accommodating for the expected travel time using the distance matrix. This is seen below in Figure 26. This takes a subset of the data to estimate how the distribution may be expected to be, with a more normal distribution reflected.



**Figure 26: Frequency of actual visit lengths reported compared with planned expected visit lengths considering travel time.**

## Travel distance analysis

The data provided to Unity Insights for analysis did not contain the travel distance to the care worker’s first appointment. Instead, these travel distances were reported as ‘False’ instead of the number of miles, so as to not interfere with travel distances calculations.

Additionally, many appointments had a travel distance reported as zero miles, in cases where a care worker had two or more appointments with the same client in a succession, i.e., one after another. In some cases, this travel distance was truly zero, where the care worker may have had two appointments in a short period of time; however, there may be cases where the care worker travelled home and back during the day, which may create incorrect readings for certain visits.

These limitations originated from the anonymisation process, which converted client post codes into anonymised node IDs, rather than the exact location of the client. Additionally, variation in exclusion criteria and analytical methodologies may result in figures reported in this report differing slightly to those reported by Procomp.

A summary of how many appointments were reported as ‘False’ and how many show travel distances as zero miles at each site is presented in Table 7.

**Table 7: The number of appointments for each site with travel distances reported as ‘False’ representing travel to the first appointment of the day, and distances reported as zero miles.**

	Site A (BL)	Site A (IN)	Site B (BL)	Site B (IN)
Number of appointments with distances reported as ‘False’	6,952 (10.1%)	12,833 (10.5%)	3,902 (8.8%)	990 (5.2%)
Number of appointments with distances reported as zero miles	3,951 (5.7%)	5,730 (5.2%)	6,294 (15.5%)	3,620 (20.0%)
Total number of appointments	68,778	122,537	44,553	19,055

## Operational data

The format of operational data available made it difficult to calculate metrics such as the number of trips per month and the contact time per client per month (Table 2). This impacted the confidence in outcomes suggested for efficiency gains in terms of hours of care delivered to clients per hour of care paid for. Data was available for the number of care workers at any given time, however, hours worked varies significantly between workers, and for some workers hours vary from week to week. As a result, hours are likely to fluctuate to an extent which is unknown, making it challenging to determine whether more care had been delivered per paid hour of work.

While precise data relating to the number of hours worked for each care worker was not available, the average number of care workers per month is lower in the intervention period for both sites (Table 2). As a result, the benefit stream in the CBA relating to the increase in care packages delivered is not likely due to a change in workforce size, rather an impact of the intervention improving efficiency.

## Evaluation methodology

The real-world nature of the evaluation introduced inherent limitations as numerous uncontrolled variables impacted the data. Notably, the landscape of care delivery has undergone changes throughout the data collection period, exerting a likely significant influence on the observed results. The dynamic nature of these external factors made it challenging to draw firm conclusions conclusively and reliably about the performance of the intervention. In a controlled environment, where variables can be meticulously managed, except for those directly influenced by the optimisation process, the ability to suggest and quantify the intervention’s performance would be more confident and precise. The reliance on real-world conditions added a layer of complexity, making it imperative to interpret the findings within the broader context of the evolving care delivery landscape.

Examples of this include the findings from Table 3, indicating a potential increase in the region being serviced by Site A, likely leading to increases in the average travel distances that would occur without Procomp's intervention, compared to baseline results. Additionally, retention rates were likely influenced by many other working condition factors not within scope of Procomp's suggestions, as well as legislation regarding sponsored workers introduced and demand factors from a reduction in care package sizes.

These factors may be mitigating a significant proportion of the impact from the intervention and led to the removal of Site B's retention rates, which previously was dramatically impacting on the health economic results seen for Scenario 2 & 3 against expectation from the qualitative data collected.

## **Cost benefit analysis**

The absence of information within the raw data on the initial starting locations for travel visits introduces a limitation in the health economic modelling. This lack of data necessitated the exclusion of an element that could potentially impact the accuracy of the results, emphasising the importance of comprehensive data coverage. Moreover, external influences affecting retention rates, such as the introduction of sponsored workers and changes in waiting lists, presented a challenge in isolating the true impact of Procomp. The interplay of these external factors with retention rates underscored the complexity of attributing changes solely to the intervention, introducing a layer of ambiguity.

The discrepancy in both the duration and timing of baseline and intervention periods across the two sites added complexity to the analysis. This discrepancy introduced challenges in making direct comparisons and highlighted the need for careful interpretation, with additional layers of standardisation being required for the health economic analysis.

The long-term benefits in terms of retention rates, anticipated from positive qualitative improvements, were observed in only one of the two sites that implemented Procomp. The data showed a slight improvement in Site A but a dis-benefit in Site B before removal due to external contextual factors given by the provider. Other factors influencing the data in Site A could include the introduction of sponsored workers and changes in waiting lists, making it challenging to establish an accurate baseline for comparison at this point.

While there was an increase in capacity, there was less inclination to utilise this added capacity due to shifts in supply and demand levels. This reluctance to utilise increased capacity may be diminishing the potential positive impact of the intervention.

The unit cost of £3,600 to hire a new care staff member may be unreliable, as the original Skills for Care 2021 report source is no longer available, so a suitable optimism bias was applied. If a more reliable figure could be sourced, this may reduce the results of this benefit stream. Receiving more accurate datasets specifically associated with hiring staff, rather than calculations based on care staff activity, could provide a deeper insight into the results at each site, and potential confounding factors.

The CBA model has a one-time cost of £8,000 applied to each site implementing Procomp, reached through discussions with the West of England project team. This may not capture the full financial implications of adopting Procomp over an extended period, where additional licensing, support, and updates may be required. When considering extrapolation to Scenario 3, it was assumed that care sites receiving Procomp intervention would have all pre-existing scheduling software replaced with Procomp. This is a limitation as there needs to be a comprehensive understanding of how Procomp integrates with, or complements, these pre-existing systems.

Not all care sites may be starting from ground zero. It is crucial to explore the existing infrastructure and technological solutions in place at each care site. Procomp's applicability and impact may vary depending on the baseline level of technology each site already possesses. It is essential to define the value addition and the efficiency gains for sites already equipped with scheduling tools. Understanding the integration strategy is crucial to evaluating the overall impact and potential disruptions that might arise during implementation.

Further, the assumption of uniform applicability of results from specific sites (A and B) to the entire South West region should be highlighted. A relatively small sample size of two providers, in addition to variations in care practices, workforce dynamics, and infrastructure across different locations may impact the generalisability of results. A more nuanced approach outside the scope of this evaluation is necessary to understand the contextual relevance of findings.

In light of the variation observed in the sector during the timeline of data collection, Unity Insights recommends exercising caution when applying health economic modelling results to decision-making. Further data collection and remodelling of results have the potential to significantly alter the current outcomes.

# 5. Discussion

## 5.1. System challenges

The evaluation has brought to light significant structural and systemic challenges that impede the optimal functionality of the technology, particularly when compared to its successful implementation in Finland and the Netherlands. One critical factor contributing to this disparity is the inconsistency amongst workers employment terms, with the majority of workers reportedly paid by the hour, and 340,000 filled posts in England on zero-hour contracts (22%) in addition to a high number of agency and temporary workers (11%) (Skills for Care, 2023). According to Procomp, care workers in Finland and the Netherlands are more likely to be on salaries with various full-time equivalents (FTE) to account for part time workers. The absence of a standardised payment system in England introduces complexities in optimising schedules due to a lack of consistency. This poses an obstacle to integration of the technology.

Another barrier to implementation stems from the fact that care providers in England are independent business, and each individual provider has power over how they operate, meaning that spread and adoption of innovation can be hindered by having to persuade a high number of individual providers separately. Additionally, variations in how rounds are commissioned across local authorities, and the unique operational models employed by different private providers, further exacerbates the challenges, creating an environment where the technology struggles to operate as effectively as desired. Adoption by other providers in the region will however build the technology's evidence base through further data capture, which may support other providers with investing resources into optimisation.

Furthermore, the need for additional transparency and data-sharing requirements adds a layer of complexity and burden to the implementation process, (an issue as raised by the provider and council interviews). This deviation from the standard operational conditions poses an additional challenge to the successful integration of Procomp, emphasising the need for a comprehensive understanding of the specific structural and systemic issues at play in the current social care environment. It is important to recognise that outside of the pilot stage of the domiciliary care workforce programme, obstacles relating to data-sharing would be minimised due to involvement from fewer organisations, meaning fewer barriers are likely to be encountered when implementing operational software outside of the pilot.

Feedback from interviews with providers highlights the dynamic conditions and evolving landscape within the domiciliary care sector throughout the data collection period of the programme. One of the key changes in the sector is a substantial surge in the number of sponsored care workers due to recent legislation facilitating a large number of sponsorships for foreign workers to fill excess demand in the domiciliary care industry. Figure 38 of the survey results shows that this change has only impacted certain regions, with Site A showing a high proportion of sponsored workers ( $n = 7$ , 50% of respondents) compared with Site B ( $n = 0$ ).

This legislative change has addressed excess demand in the domiciliary care industry, resulting in supply beginning to outweigh demand in certain areas. As a result, waiting lists for domiciliary care for certain providers have been reduced significantly or even removed entirely, as has been the case for Site A. While this benefits service users, the potential to precisely quantify efficiency gains and reduced gaps in care provision may be constrained by the context of the industry's ongoing changes.

## 5.2. Barriers & enablers uncovered

### Provider onboarding

Data capture on the proposition and onboarding process of the pilot was not included within scope of this evaluation. Through conversation with the project team, it is understood that at the selection stage for the sites, as detailed previously in the introduction section ('Council and provider selection criteria'), the majority of those contacted for one council declined, although the reasons for this are not known. The other pilot area's proposition was to put one provider forward, which formed part of the pilot.

Of the three original provider sites within the pilot, one was withdrawn after the interim stage due to changes from the intervention not occurring. Qualitative data collected from this site suggests that this may be due to a perceived lack of need, and therefore expected benefit of the intervention, with barriers to implementation raised. Qualitative data collected from the domiciliary care workforce (inclusive of care worker, coordinators and managers) for this site indicated that staff satisfaction levels were indeed high, supporting this position of potential lesser need; however, quantitative data was not collected to form an assessment of need for other outcomes such as care package and travel optimisation.

### Implementation

This programme's strategic optimisation relies upon agreement with the council and providers. Changes recommended were acceptable to councils and providers at two separate intervals after discussion, according to the project team this included flexible start times, balancing demand by having non-critical activity at off-peak times, discussions around gender of care worker, use of optimisation software by providers, reviewing double-ups and reviewing care assessment practices.

Providers' primary barriers to implementation came from the data processing for the intervention team, due to data sharing information governance requirements as well as the skill mix and resource availability required. Other factors raised include the speed between provision of the data and provision of recommendations from Procomp as rota requirements could change impacting the applicability of these. The impact of these factors for providers was seemingly partially mitigated upon further involvement in the project. A theme emerging from the provider interviews was that completing sets of changes was notably easier the second time. This could indicate that initial resistance to change was overcome or that engagement with the sites improved the ease of



implementation. Both providers also believed the intervention could be implemented wider and that it could be beneficial to the domiciliary care market.

For both domiciliary care staff and clients, the interviews demonstrated the crucial impact that continuity of care, in terms of the consistency of the same carers seeing clients, has. Although optimisation may lead to initial changes in the care provider visiting clients, it is important to minimise the impact on continuity of care over a sustained period to avoid fallout with these cohorts. This factor is more dramatic amongst longer serviced clients due to deep seated routines being formed.

Resistance to change was cited as further theme that emerged. This was emphasized by observing the delayed timelines in order to embed new processes to meet the programme objectives. Qualitative data from council interviews suggested that providers scouted for inclusion in the pilot had a preference for slow and minor change, alluding to a need to ensure pilot sites selected have both a need and a willingness to change the status quo in favour of their staff.

### 5.3. Effectiveness metrics

Regarding the impact on care worker continuity, the quantitative findings provide the same outcome for each site. Site A and Site B both show the same continuity, with an average of 14 care workers seen by each client at Site A, and 15 care workers seen by each client at Site B across both periods. For both sites these findings do not present a substantial difference, the impact of the intervention on care worker continuity seems minimal under these conditions. Such findings highlight the challenges of attribution of the solution, since there are various external factors impacting overall outcomes.

Travel distances saw minor variation across the full intervention period average compared to baseline results as seen in Figure 17 & Figure 18 for each site. Looking at a small subset of the data, a reduction in travel distances is seen for the month directly after implementation of changes, with a fall from 2.44 to 2.25 miles (-7.8%) for Site A from August 2022 to September 2022 and 2.98 to 2.86 miles (-4.0%) for Site B from May 2023 to June 2023. This suggests that the impact is not sustained across an extended period and that more frequent implementation of changes needs to occur to see consistent effectiveness for this metric. It is also important to consider the impact that the data collection format may have on the results, qualitative data highlighted a 37.1% increase (Figure 4) in those never needing to cut appointments short compared to baseline results for Site A. This may be due to optimisations on travel distances but may not be reflected within the quantitative dataset and therefore calculations on travel. Interviews with provider leads raised some feedback from care workers that included a reduction in travel distances.

Regarding the results obtained from the analysis of domiciliary care appointment data, other factors must be considered when interpreting the results. In the survey, care workers report having experienced an overall improvement in workload and time available to travel between appointments, which suggests that Procomp is effectively improving planning processes by allowing a more appropriate amount of time between appointments.

Additionally, Site A were reportedly required to expand over a broader and more rural geographical area, evidenced by the results presented in Table 3. This likely took place in order to meet their capacity given their diminishing waiting list and would have resulted in care workers having to travel further for appointments. Despite this, the results of the analysis of schedules shows no significant increase in mileage per visit. This suggests that at the very least, Procomp serves as a viable tool to support achieving desired outcomes. Considering the broader context of the evolving landscape, however, the quantitative metrics can be interpreted as a favourable outcome for the value of Procomp, where it is likely that the outcome of metrics such as the average distance travelled per appointment may have been much worse without the optimisation of care rounds.

Furthermore, a noteworthy consideration in assessing the impact of Procomp optimisation is the observed degradation of effects over time. The optimisation process involves the refinement of all rounds present at the time of optimisation, and while these initially lead to a reduction in distance travelled, the sustained benefits tend to dilute over time. The turnover of both staff and clients, coupled with reduced involvement of Procomp, contributes to this gradual diminishing of optimisation benefits. This trend is illustrated in Figure 17, where a decline in distance travelled immediately follows optimisation. This is followed by a progressive increase in distances across the following months, until rounds were optimised again in April 2023 (as illustrated in Figure 2), where a decline in distances is observed thereafter. It is important to note that in a real-world setting outside the programme, Procomp would likely be used to optimise rounds more frequently, potentially on a weekly or even daily basis. This regular optimisation is likely to yield additional benefits not captured within the programme's timeframe, offering a more dynamic and responsive approach to the evolving needs of both staff and clients.

## 5.4. Value

While the outcome of performance metrics can be considered positive when considering the broader context impacting the data, the cost-benefit analysis is unable to factor in these additional considerations. The health economic model suggests, due to the favourable performance metric outcomes in terms of travel distance reduction and increased care packages and Site A retention, that overall, the solution positively impacts finances. Positive BCR's are seen across the five-year period for all scenarios, indicating cost-effectiveness, ranging from 2.99 to 3.58. Minor positive NPV's are seen yearly after year 1 of £12k on average in scenario 1, which indicates the scale of impact per provider estimated from the modelling.

The sensitivity analyses underscored the uncertainty associated with assumptions, and the economic feasibility, particularly in Scenarios 2 and 3. Balancing the qualitative benefits with the economic considerations becomes essential in determining the practical viability of Procomp implementation in the broader context of domiciliary care.

In summary, the evolving landscape poses challenges in precisely measuring the impact on average travel distances and quantifying efficiency gains. Despite these complexities, the fact that performance metrics have not worsened and, in some instances, have improved amid the

changing context is a noteworthy positive outcome. Combined, the results of the different components of the evaluation suggests that logistical optimisation software, such as Procomp, is capable of creating benefits from those included in this evaluation, highlighting the potential for a sustained positive impact.

## 5.5. Environmental sustainability

Carbon emissions was not explicitly included within the health economic modelling, yet benefit stream 1 related to travel distance, which naturally is associated with carbon emissions. These findings varied across scenarios. Scenario 1, focused on Site A, indicated a negative effect, suggesting a slight increase in travel distance and potentially higher carbon emissions. As discussed in the discussion under the value domain, this is likely to be a consequence of expansion across a wider, more rural area due to supply beginning to outweigh demand in the area. Conversely, Scenario 2 (Site A and B combined) and Scenario 3 (South West extrapolation of Scenario 2) demonstrate positive outcomes, with reduced travel distances and potential carbon emission benefits. These disparities underscore the contextual nuances influencing Procomp's effectiveness in optimising care rounds and mitigating the environmental impact. The mixed results emphasise the importance of considering specific site characteristics and operational dynamics when assessing the environmental implications of implementing Procomp in domiciliary care services.

Sustainability in this context is focused primarily on whether Procomp has been effective in reducing mileage for domiciliary care workers during home visits. Reducing mileage is important within the NHS green agenda and procurement requirements, which call for further reductions in carbon emissions (NHS England, 2023). The impact of the optimisation process on mileage reduction appears unclear when focusing solely on the available quantitative appointment data, which suggests limited benefits in this area. A more nuanced understanding, however, is gained by considering other insights highlighted through the interviews, surveys, and additional perspectives provided by the project team.

Factors such as incorporating additional travel time into planning and expanding services across a broader, more rural geographical area could potentially contribute to an increase in the average distance travelled to appointments. Despite these challenges, the relatively consistent results observed for the baseline and intervention periods imply that Procomp may have played a role in mitigating mileage when compared to what it would have been without schedule optimisation. Additionally, as raised previously, should the impact seen the month after implementation of changes be maintained, benefits may be visible environmentally.

Overall, the optimisation process could yield benefits in terms of reducing carbon emissions; however, the complexities that underpin the data make it difficult to quantify the benefits from an emissions perspective at this stage.

## 5.6. Care worker perceptions

Results from the survey present overall a very positive picture for how the care workers have been impacted by the introduction of Procomp, highlighting a substantial improvement in the reported satisfaction across a wide range of different job elements. This provides evidence that the care workers feel that the intervention has benefited them in many different ways.

The results in Figure 7 and Figure 8 suggest some of the most significant benefits to the care workers include feeling more supported with different aspects of their role, such as dealing with unsettling feelings (Site A: +38.5%; Site B +35.0% agree or strongly agree), challenging existing practice to improve care provision (Site A: +37.9%; Site B +25.9% agree or strongly agree), and health and wellbeing (Site A: N/A; Site B +25.9% agree or strongly agree). It is likely that these benefits stem from improved planning processes, enabling an appropriate amount of time to be dedicated to supporting team members, which may also indicate improvements in capacity for both care workers and their line managers.

Other factors contributing to the positive reception by care workers may be explained by the context of transformation, where workers get a sense of efforts being made to improve their conditions and change the industry practice for the better. This mindset towards change and improvement may itself make workers feel more supported, giving rise to the higher levels of satisfaction reported by workers across both providers.

The improvements described from the survey results are also likely to have a knock-on effect on other operational elements for care providers such as staff retention rates. Qualitative results presented in Figure 9 suggested that across both providers, care workers are more likely to see themselves working at their current job in a years' time. The lack of retention data available and the relatively narrow length of data collection for the intervention period make it difficult to quantify the impact on retention rates, but, based on quantitative data collected, a slight positive result is seen for Site A, with a significant negative for Site B. For Site B, this result contradicts the qualitative feedback and therefore could be occurring due to limitations within the data collection method, time period and external factors. Unity Insights requested the site to provide context for potential factors impacting these results, but no response was received.

## 6. Conclusion

In conclusion, the qualitative feedback and results obtained from staff responses and interviews demonstrate an overall mixed reception of Procomp, indicating notable improvements in schedule planning and influencing various aspects of workers' job satisfaction but with perceived substantial barriers to implementation, although improved over time. The positive mindset towards change and improvement, as identified through the qualitative analysis, has contributed to an increased sense of support among care workers. The changing nature of the workforce, highlighted in interviews and project logs, further emphasises the dynamic environment in which Procomp operates, impacting quantitative results.

While the quantitative analysis reveals no significant concerns and suggests that Procomp can be effective, the changing landscape poses challenges in accurately measuring the impact on average travel distances and efficiency gains.

The cost-benefit analysis estimates Procomp to be generating a positive return on investment, as positive results are seen within the sensitivity analysis of each scenario, although reliant on a positive impact seen for care packages delivered and the low costing structure applied after year 1.

The results acknowledge the need for further exploration in a more stable environment. Challenges in aligning the UK system with the successful models in other parts of Europe, such as the Netherlands and Finland, highlight the complexity of implementation. Nonetheless, the qualitative feedback underscores the potential value of influencing providers to adopt a logistical optimisation tool such as Procomp. While the current assessment cannot definitively determine Procomp's cost-effectiveness compared to alternatives, the technology's stable performance suggests its potential long-term viability, pending further exploration in a more conducive environment.

To better reflect the full potential of the optimisations, changes need to be continually implemented, key factors for this include the need to be led by the council, heavily involve project management and to understand the intricacies / cultural change required. A separate paper produced by the WoE project team will seek to highlight the additional challenges faced from their perspective including understanding policy context and external factors influencing implementation of such a solution.

Overall, the evaluation results outline that, should the barriers and challenges in the market be overcome or mitigated, there is an opportunity for strategic optimisation to achieve impactful change on the desired outcomes of the programme.

## 7. Recommendations

Through the evaluation process, Unity Insights suggests that the following recommendations are considered to support successful integration and outcomes of the intervention as well as areas for further exploration and evidence base creation.

### Integration and acceptability

- Aiming to support further integration of changes on a more frequent basis in order to promote greater beneficial outcomes, it is suggested that exploration is conducted into enabling providers to have direct access to an interface of the optimisation tool. This could minimise barriers including the resourcing required for data processing under IG requirements and allow for faster embedding of changes.
- As detailed by the councils involved in this pilot, greater transparency and consistency amongst providers regarding the data collection process for planned and actual visit lengths, and the allocation of travel time, could improve outcomes of the intervention. In practice to overcome this barrier, a significant overhaul may be required regarding the data processes and flexibility of providers to create rounds, as this can vary from MS Excel sheets to ECM software. Should this occur, this could additionally remove barriers to wider rollout of optimisation tools in the sector.
- Technical considerations of the intervention involve integrating features to cater to visit requirements. Many acceptability concerns among providers stem from the ability to consider client-specific requirements or other overlooked nuances. While it may be challenging to implement these changes on a large scale when considering these variables, integrating additional factors into the schedule could enhance provider engagement and implementation. Considerations raised included the domiciliary care staff skills matrix, parking requirements, and client preferences.

### Further evaluation

- Due to known limitations incurred through the scale and scope of this evaluation, when determining the impact of the intervention on long-term metrics such as domiciliary care staff retention rates, it is recommended that additional data collection and intervention monitoring within the current pilot occurs (ideally from an increased number of sites), before conclusions are reached.
- Further work should aim to stabilise the operating conditions of the care workers, to avoid external factors affecting the results. This would mean that observed changes could be attributed directly to the optimisation process, making outcomes less ambiguous. A potential solution to this may include looking at a shorter data collection period, considering impact over a daily or weekly timescale rather than monthly to reduce chance of changes occurring. Alternatively, a review of retention data could occur after a further period to

create a potential difference-in-difference analysis against an appropriate local comparator of providers. Other possibilities to stabilise conditions should be explored further by the programme team.

- Implementation of changes through the data collection period by providers has occurred at two primary intervals for both sites. Ideally, according to the intervention and project team, rota reviews and changes should be occurring regularly, aiming for a weekly basis. Should this be feasible for a site, this could drastically impact the findings seen within this report as results may have been diluted over time; therefore, it is recommended that implementation of changes at this frequency, for a sustained period, is attempted and evaluated should this be the desired practice.
- To optimise domiciliary care provision in the UK, it is crucial to understand the challenges that exist within the care system. Private providers operate with distinct procedures, meaning individual negotiations are required for implementing changes, posing a significant barrier to widespread adoption. Overcoming this obstacle involves fostering collaboration among providers to share insights on interventions like optimisation tools, facilitating broader adoption and knowledge transfer, gradually breaking down the barrier over time.
- Further work evaluating optimisation should seek to capture operational data such as precise working hours and turn-over rates to obtain a more reliable assessment of the impact of optimisation on workforce efficiency. Additionally, the programme team and the technology provider have noted that care package sizes have decreased during the intervention period. While outside the scope of this evaluation, further work should consider investigating the impact of this change, and whether it has occurred as a result of the optimisation. It may also be useful to look at alternative patterns of work, such as paying for shifts compared with zero-hour contracts.
- While it was not within the capacity of this evaluation, additional studies should consider measuring the impact on service users, given that these services exist to support these people. Some examples of elements that could be considered includes care worker continuity, consistency of visit times, complaints, and service reliability.



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# 9. Appendix

## 9.1. Appendix A: Metrics table

Table 8. Planned metrics table.

Outcome	Metric	Data source
<b>Reduction in miles</b>	Average number of miles travelled per care visit.	Provider dataset
<b>Reduction in travel time</b>	Average travel time per care package (for each care worker).	Provider dataset
<b>Reduction in non-renumerated time</b>	Average % of non-renumerated time per care worker per week/month.	Provider dataset
<b>Increase in contact time</b>	Total contact time per care worker to increase.	Provider dataset
<b>Increase in the number of care packages delivered per care worker</b>	a. Total care workers and total service users: ratio of service users to care workers. b. Visit length distribution.	Provider dataset
<b>Increase in continuity of care and contact time</b>	Relationship continuity: how often the service users receive care from same care worker or small group of regular care workers. a. Average number of care workers per service user.	Provider dataset
<b>Improved care worker satisfaction</b>	Qualitative: Care worker satisfaction (feeling valued, part of a team, relationship with client).	Staff survey
<b>Improved communication between LA and domiciliary care provider</b>	Qualitative: specific interview questions.	Semi-structured interviews with Provider leads & LA
<b>Improved workforce utilisation</b>	Capacity: % increase in the number of visits possible per care worker (amount of people working and amount of service time).	Provider dataset

Outcome	Metric	Data source
<b>Reduced carbon footprint</b>	CO <sub>2</sub> emission (average milage per visit by care worker).	Provider dataset
<b>Less unmet demand no. of users of high priority who are awaiting care</b>	a) No. of users of high priority who are awaiting care should be less than 40 or 50 days (define high priority).	Data not available
<b>Improvement in average time to responding to new requests</b>	Average response time of the domiciliary care provider to new requests.	Data not available
<b>Improved staff retention</b>	a) Decrease in staff turnover weekly/monthly.	Exact data not provided. Estimated from the provider dataset

## 9.2. Appendix B: Semi-structured interview questions – Council staff

**Table 9. Semi-structured interview questions - Council staff.**

Question number	Question
1	Please explain what your current role is?
2	How has Procomp impact been visible or interacted with your role?
3	Do you have any other comments you would like to add?
4	What are the key challenges in supporting Domiciliary care providers in your role? a. How can/has Procomp support(ed) on these challenges?
5	How effective do you feel communication between domiciliary care and providers was prior to Procomp’s involvement? a. How has Procomp’s involvement influenced this?
6	What surprised you most about the Procomp findings and recommendations?
7	Have you been able to implement any changes or plan to at this stage?
8	What are the key factors influencing the acceptability and ability to implement suggested recommendations by Procomp? a. Start time flexibility, care worker gender, etc?
9	Do you think the recommendations that have been introduced are sustainable?
10	Do you think Procomp’s intervention can create a societal impact on the provision of domiciliary care? a. If so, why?
11	Do you feel that the data collection process with provider has been able to run smoothly? a. How could this process be improved going forward?

Question number	Question
12	<b>Cornwall</b> – why do you think other sites have struggled to implement the changes?
13	What have you learnt during this process? (About Providers, about developing/commissioning/brokering rounds, about implementing changes in Council and providers)

## 9.3. Appendix C: Semi-structured interview questions – Provider site leads

**Table 10. Semi-structured interview questions - Provider site leads.**

Question number	Question
1	Please explain what your current role is?
2	How has Procomp impact been visible or interacted with your role?
3	Do you have any other comments you would like to add?
4	<p>Do you feel that the data collection process with Procomp has been able to run smoothly?</p> <p>a. How could this process be improved going forward?</p>
5	<p>Are you able to implement the recommendations made by Procomp for round optimisation?</p> <p>a. Have you implemented any changes or plan to? Why, why not?</p>
6	How could the council or Procomp support you further to make changes?
7	What are the key factors influencing the acceptability of suggested recommendations by Procomp?
8	<p>How effective do you feel communication between domiciliary care and providers was prior to Procomp's involvement?</p> <p>a. How has Procomp's involvement influenced this?</p>
9	What do you feel are the key barriers to changes in the process of commissioning rounds for domiciliary care?
10	<p>Has Procomp helped support your awareness of care worker schedule patterns?</p> <p>a. If so, how?</p>
11	Do you think Procomp's recommendations would be appropriate in other region or provider settings?

Question number	Question
12	Do you think the recommendations that have been introduced are sustainable?
13	Do you think Procomp intervention can create a societal impact on the provision of domiciliary care? a. If so, why?
14	What have you learnt during this process? (About logistics, implementing changes)

## 9.4. Appendix D: Care worker survey questions

**Table 11: Questions asked in the survey sent to care workers after the optimisation of rounds. The questions outlined here are only those asked in the intervention survey, given that some questions from the baseline survey were removed, hence they were not included in the survey analysis.**

Question	Response type	Pre / post inclusion
What age range are you?	Multiple choice	Pre and post
What gender do you identify as?	Multiple choice	Pre and post
Please describe your ethnicity	Multiple choice	Pre and post
Please tell us your nationality	Multiple choice	Pre and post
Do you work full or part-time?	Multiple choice	Pre and post
What type of employment contract do you have? (please tick the box which best describes the contract you have)	Multiple choice	Pre and post
In a typical working week, how many hours do you work? [Contact time (paid)]	Free text	Pre and post
In a typical working week, how many hours do you work? [Travel time (paid)]	Free text	Pre and post
In a typical working week, how many hours do you work? [Travel time (unpaid)]	Free text	Pre and post
Do your weekly hours vary from week to week?	Multiple choice	Pre and post
Why might your weekly hours of work change?	Free text	Pre and post
How long have you been a Care Worker?	Multiple choice	Pre and post
How often have you cut short your session with a client to make sure you reach your next visit on time?	Multiple choice	Pre and post



Question	Response type	Pre / post inclusion
Is there anything else you would like to tell us about your current working patterns that you feel are important to share with us?	Free text	Pre and post
Satisfaction ratings (see Figure 5 and Figure 6 for individual questions)	Matrix (satisfied with)	Pre and post
Agree with statements (see Figure 7 and Figure 8 for individual questions)	Matrix (agree with)	Pre and post
Do you see yourself working in your current job in a year's time?	Multiple choice	Pre and post
If you answered 'no' or 'unsure', please tell us why you say this	Free text	Pre and post
Have you received any comments or feedback regarding the changes from patients?	Free text	Post
What has been your experience of patient feedback, from the changes in schedules, since Procomp's implementation?	Free text	Post

## 9.5. Appendix E: Health economic modelling approach

### Cost-benefit analysis approach

A cost-benefit analysis (CBA) aims to determine whether the economic value of an intervention can justify the service's costs by comparing the cost of two or more alternatives and reviewing the return on investment (ROI) based on a static model of the world. Savings are estimated from the perspective of the UK's society. It is not possible to include all costs and benefits within the appraisal, however, the service's effects should be considered and outcomes that are most likely to determine the difference between alternative options should be included within the appraisal. The net present value (NPV) and benefit cost ratios (BCRs) are important economic and summary measures that can be derived from such an appraisal and consist of the following formulae:

$$\text{Net present value} = \frac{\text{Net cash flow}}{(1 + \text{Discount rate})^{\text{Time of the cash flow}}}$$

$$\text{Benefit cost ratio} = \frac{\text{Present value benefits}}{\text{Present value costs}}$$

The BCR measures the present value of benefits against the present value of costs. This ratio summarises the overall relationship between relative benefits and costs of the Procomp programme (e.g., £X return for every £1 invested). A BCR greater than one indicates that Procomp may deliver a positive NPV (e.g., a BCR of two indicates that for every £1 spent, there is an expected £2 return). If the BCR is equal to one, then the present value of the benefits equals that of the costs. Where the BCR is less than one, the value of the costs will outweigh the benefits.

It is important to remember that summary measures are not without limitations (e.g., measures may not fully capture all potential impacts of the Procomp programme and counterfactual pathways).

## Optimism bias

Optimism bias (OB) is defined as “*the tendency for a project’s costs and duration to be underestimated and / or benefits to be overestimated*” (MacDonald, 2002), as found by historical UK government reviews on public sector procurement. To account for such optimistic estimates, the health economic model applied OB correction factors (Figure 27) in response to the level of uncertainty in the data or assumptions used within the model.

		Data Source											
		Confidence grade		Formal service delivery contract costs		Practitioner monitored costs		Costs developed from ready reckoners		Costs from similar interventions elsewhere		Cost from uncorroborated expert judgement	
				Figures derived from local stats / RCT trials		Figures based on national analysis in similar areas		Figures based on generic national analysis		Figures based on international analysis			
		1		2		3		4		5			
Age of Data (publication)	< 2 Years	1	1.1	0%	2.1	10%	3.1	15%	4.1	25%	5.1	40%	
	2 - 3 Years	2	1.2	5%	2.2	10%	3.2	15%	4.2	25%	5.2	45%	
	3 - 5 Years	3	1.3	10%	2.3	15%	3.3	20%	4.3	30%	5.3	50%	
	5 - 10 Years	4	1.4	15%	2.4	25%	3.4	30%	4.4	40%	5.4	55%	
	> 10 Years	5	1.5	25%	2.5	30%	3.5	40%	4.5	50%	5.5	60%	

Figure 27: Optimism bias matrix.

The risk of an over-optimistic estimate is greatest when data is of low quality. This is due to the applicability of the estimate to the modelled pathway (HM Treasury, Public Service Transformation Network & New Economy, 2014). The quality of the data is defined by the relevance of the source data to the project data or age. Each data variable is graded according to its quality, and an assumption-specific OB factor is applied to the calculation at the benefit and cost stream level. This factor is decided by the lowest grade amongst the stream's data inputs. To ensure further prudence, an extra optimism bias of 15% is applied in addition to the assumption-specific OB within benefit and cost streams.

In addition to benefit and cost specific optimism biases, a universal optimism bias correction of 15% was applied to all benefits and costs to ensure maximal prudence in the estimation of the impact of the intervention, as well as a GDP deflator to transform all inflation-adjusted figures in future years into current prices (present value) in line with *The Green Book* appraisals (HM Treasury, 2022b).

The approach taken by Unity Insights was an adaptation of the model created by the Greater Manchester Combined Authority (GMCA) Research Team (HM Treasury, Public Service Transformation Network & New Economy, 2014). The GMCA model was featured in the supplementary guidance of HM Treasury's Green Book and offered a robust and prudent approach to economic analysis (HM Treasury, 2022b).

## Discounting

Discounting is a technique that enables the comparison of costs and benefits on a consistent basis, and accounts for the concept of 'social time preference' (i.e., allows costs and benefits that occur at different time periods to be compared on a present value basis). Discounting was applied to all future costs and benefits and was not applied retrospectively. A discount rate of 3.5% was applied to all benefits included to deflate outcomes to real terms and reflect the changing value of healthcare within GDP (HM Treasury, 2022b).

## Adjusting for inflation

Ensuring that costs and benefits are adjusted for inflation removes the general effects of inflation and presents costs and benefits included within the appraisal in 'real' base year prices, rather than in nominal prices (i.e., the first year of the intervention). Within this, a Gross Domestic Product (GDP) deflator of 2% (Office for Budget Responsibility, 2022) was used to convert nominal to real values. Various rates were applied depending on data type, namely:

- CPI Inflation rate (Office for Budget Responsibility, 2022)

## Sensitivity analysis

A degree of uncertainty in the estimates of the model are accounted for by using sensitivity analysis. It is important to note that the sensitivity differs from optimism bias because sensitivity is applied on each individual assumption or input in the model, rather than by benefit or cost stream, in the case of optimism bias. The method used by Unity Insights is Monte Carlo simulation, which is used to provide a range of estimates of the overall return on investment/net benefit.

Monte Carlo analysis is a modelling technique that simulates the impact of the expected variance in key variables on the output of interest, in this case the net present value return on investment.

## Benefit and cost streams

### ***Benefit stream 1: Reduction in travel distance***

The purpose of this benefit stream is to estimate the potential monetised benefits for a reduction in travel distance. Reduced travel distance for care workers is crucial as it leads to increased operational efficiency.

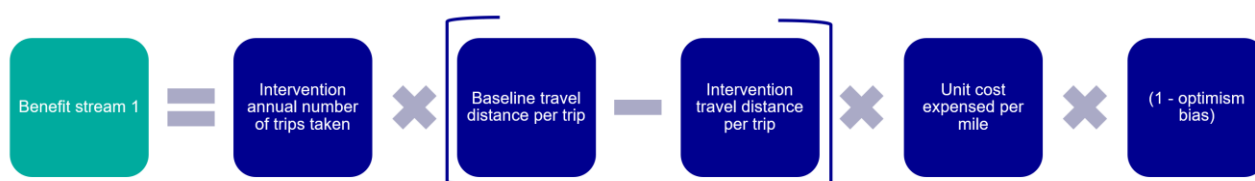
The variables within benefit stream 1 for Site A and Site B can be seen in Table 12.

**Table 12: Benefit stream 1 variables assumed for Site A and B.**

Variable	Site A	Site B
Intervention annual number of trips taken	104,083	43,356
Baseline travel distance per trip (miles)	2.307	3.051
Intervention travel distance per trip (miles)	2.334	2.959
Unit cost expended per mile	£0.45	

- All travel related variables were calculated using raw project data received from the respective sites.
- Every mile of travel saved was assumed to have a unit cost of £0.45 (GOV.UK, 2022).
- The variables for Scenario 1 were those of Site A only, which had an assumption-specific OB of 10% applied.
- The variables for Scenario 2 were those of Site A and B combined, which had an assumption-specific OB of 10% applied.
- Scenario 3 had the assumption-specific OB of 40% applied.

The calculation for benefit stream 1 is displayed in Figure 28.



**Figure 28: Calculation for benefit stream 1.**

***Benefit stream 2: Increased care packages delivered***

This benefit stream represents improved allocation and distribution of care services. By optimising schedules and assignments, more care packages can be delivered within the existing workforce. This can lead to shorter waiting lists for care, improved client outcomes, and increased revenue from delivering the care packages. This monetised benefit will be realised by providers, and to council commissioners it represents increased capacity to meet demand.

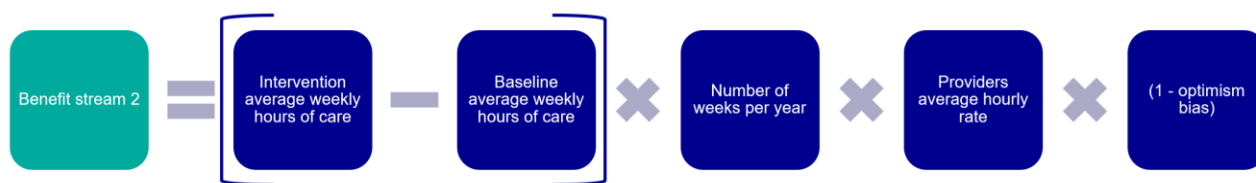
The variables within benefit stream 2 for Site A and Site B can be seen in Table 13.

**Table 13: Benefit stream 2 variables assumed for Site A and B.**

Variable	Site A	Site B
Baseline average weekly hours of care	2149.77	704.15
Intervention average weekly hours of care	2163.44	721.81
Average weekly hours of care difference	13.67	17.66
Number of weeks per year	52.14	
Providers average hourly rate	£23.92	

- All hours of care related variables were calculated using raw project data received from the respective sites.
- The providers hourly rate was assumed to be £23.92, which was identified through correspondence with an expert at the local council.
- The variables for Scenario 1 (Site A only) and Scenario 2 (Site A and B combined) both had an assumption-specific OB of 15% applied.
- Scenario 3 had the assumption-specific OB of 40% applied.

The calculation for benefit stream 2 is displayed in Figure 29.



**Figure 29: Calculation for benefit stream 2.**

### ***Benefit stream 3: Improved staff retention***

This benefit stream represents the impacts of having an improved staff retention rate as a result of utilising the Procomp service, and the associated cost savings that occur. High turnover rates can be costly due to recruitment and training expenses, as well as the potential negative impact on client care. Improved staff retention indicates higher job satisfaction and can lead to financial savings associated with reduced turnover-related costs.

The retention rate data for Site B was excluded from the cost benefit analysis. This decision was made because the quantitative data was in conflict with qualitative insights that suggested improved job satisfaction and intentions to stay in the role. To understand this discrepancy, further discussions were held with the site lead. It was revealed that there was an increase in turnover during this period, which the site lead clarified was not related to the Procomp programme. Consequently, this Site B data was omitted from the model for Scenario 2, and the extrapolation of this benefit stream in Scenario 3 used the results from Site A only. It is important to note that when interpreting the results for Site A, the potential impact of similar factors within the data collection timeframe should be carefully considered.

The variables within benefit stream 3 for Site A can be seen in Table 14.

**Table 14: Benefit stream 3 variables assumed for Site A.**

Variable	Site A
Number of staff in month one of intervention	54
Baseline staff retention rate	0.737
Intervention staff retention rate	0.759
Staff retention rate difference	+ 0.022
Unit cost per new staff hired	£3,600

- All staff related variables were calculated using raw project data received from the respective sites.
- The unit cost per new staff hired was assumed to be £3,600 in 2020, this is based on the Skills for Care cost of recruitment template for a small adult care provider. (SkillsforCare, 2020, LogicMelon, 2020).
- The variables for Scenario 1-3 each had an assumption-specific OB of 50% applied.

The calculation for benefit stream 3 is displayed in Figure 30.

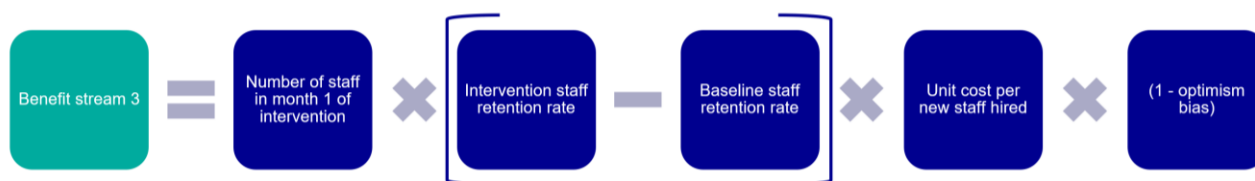


Figure 30. Calculation for benefit stream 3.

## Costs

### ***Cost stream 1: Council staff training and maintenance costs***

The council staff member working with sites for the purposes of the programme required training and support to understand the technology, processes, and how to effectively integrate it into their workflows. Converting this training time and support into a cost using salary bands is important because it helps quantify the financial investment required to ensure that these staff members are equipped to lead the implementation process effectively.

Discussions with the project team confirmed that council associated costs would only be incurred in year one and possibly repeating every five years.

The variables within cost stream 1 for Site A and Site B can be seen in Table 15.

Table 15: Cost stream 1 variables assumed for Site A and B.

Variable	Site A	Site B
Number of council staff	1	1
Council staff hours required per week	6	
Council staff number of weeks worked per year	30	
Council staff hourly salary	£40.10	

- The single council staff member at each of the sites was combined for Scenario 2, so that there were two council staff members in total.
- The council variable assumptions were reached through correspondence with the West of England project team.
- The council staff hourly salary (£40.10) was calculated by dividing the mid-point of the annual basic pay for Adult Social Care Transformation and Commissioning Service Manager (£63,803) by the number of weeks worked annually (43) by the number of hours worked per week (Westmorland & Furness Council, 2024).
- Cost stream 1 had an assumption-specific OB of 15% applied to both Scenario 1 and Scenario 2.
- Scenario 3 had an assumption-specific OB of 40% applied.

The calculation for cost stream 1 is displayed in Figure 31.



**Figure 31: Calculation for cost stream 1.**

### ***Cost stream 2: Implementation costs***

Engaging the Procomp service is accompanied by initial implementation costs. The initial implementation costs cover activities such as software setup, customisation, and integration with existing systems. Understanding these costs is vital as it provides transparency about the financial commitment associated with adopting the technology.

The variables within the cost stream were calculated as follows:

- The programme cost for Sites A and B was assumed to be £8,000 respectively, totalling £8,000 for Scenario 1 and £16,000 for Scenario 2. It was assumed that this cost would only occur in the first year of the model. This assumption was reached through correspondence with the West of England project team.
- Cost stream 2 had an assumption-specific OB of 0% applied to both Scenario 1 and Scenario 2, since these were confirmed costs that occurred in the first year.
- Scenario 3 had an OB of 40% applied.

The calculation for cost stream 2 is displayed in Figure 32.





**Figure 32. Calculation for cost stream 2.**

### **Cost stream 3: Provider staff implementation and maintenance costs**

Provider sites collecting and submitting data, reviewing snapshot suggestions, and implementing changes requires time and effort from provider sites. Estimating the associated costs is important to ensure that all stakeholders are aware of the resource commitments needed for a successful implementation.

The variables within cost stream 3 for Site A and Site B can be seen in Table 16.

**Table 16: Site A and B variables used in cost stream 3 calculations.**

Variable	Site A	Site B
Number of provider staff	1	1
Provider staff hours required per year	12	
<b>Provider staff hourly salary</b>	<b>£21.10</b>	

Each variable was assumed to be identical across both sites for the purposes of this cost stream.

- The one staff member at each site was combined for Scenario 2, so that there were two provider staff in total.
- The provider staff hourly salary (£21.10) was calculated by dividing the mean home care workers annual salary (£33,578) by the number of weeks worked annually (43) by the number of hours worked per week (37; PSSRU, 2022).
- Cost stream 3 had an assumption-specific OB of 15% applied to both Scenario 1 and Scenario 2.
- Scenario 3 had an OB of 40% applied.

The calculation for cost stream 3 is displayed in Figure 32.



Figure 33. Calculation for cost stream 3.

## 9.6. Appendix F: Project team - Learnings log summary

Insights from the project team’s reflections have been summarised below captured through meetings with the providers, councils and with Procomp external to Unity Insight evaluation process at the interim stage.

### Culture shift and resistance

A culture shift was highlighted as change was required from both a service user and provider perspective regarding the continuity of care. For example, staff are encouraged to move from thinking "my round" to working as a team to deliver the care, and to alter the language to "routes" as part of an adjustment in mindsets. Similarly, for service users "my carer" starting to be replaced with "my provider".

Several implementation issues have been noted, including push back from care workers, service users and their family members, on the potential reduced continuity of specific care workers with service users. In addition, difficulty in flexing visit times with existing clients were noted, given that they have more established routines, so change is seemingly more accepted with newer service users.

The availability of resourcing requirement to develop and co-ordinate a plan to deliver on the insights and recommendations of the Procomp report has been identified as a requirement to successfully implement the project.

### Client requirements

Findings reiterated that more specific understanding of client requirements is required from Procomp. This was further explained as smaller providers may have more detailed client needs than other providers. An example was given where a service user with dementia or diabetes will have more desire and need to have the same care worker and care at a specific time, for example eating and then receiving an insulin injection.

### Project team

Several barriers to change from the project team perspectives were mentioned, these include:

- The challenge for providers to share data, specifically with the digital competence within the home care providers.

- Smaller providers have less flexibility to cover staff sickness and hence build gaps into the schedule and may not wish to fill these.
- The council lack of resources available and invested into the project.
- The political negativity, custom and practice against visits less than 30 minutes in the UK, compared to other countries such as Finland where Procomp originated.

## 9.7. Appendix G: SWAHSN original Theory of Change model

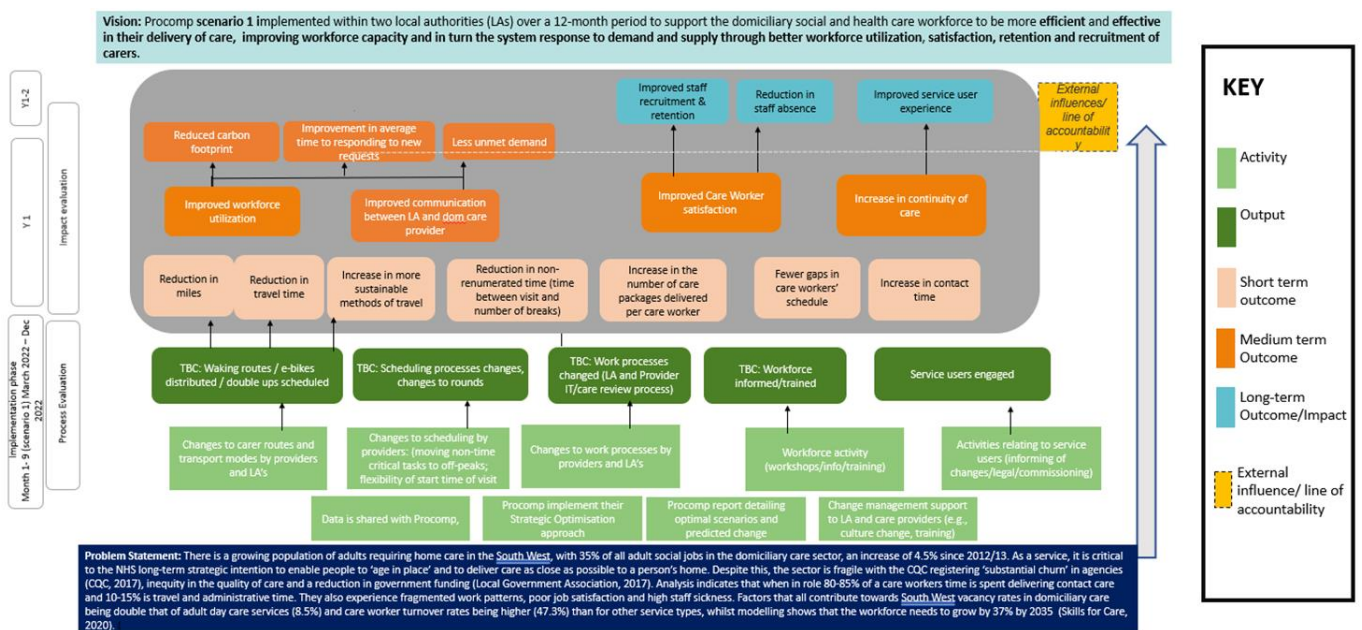


Figure 34: SWAHSN Theory of Change model

## 9.8. Appendix H: Thematic analysis framework

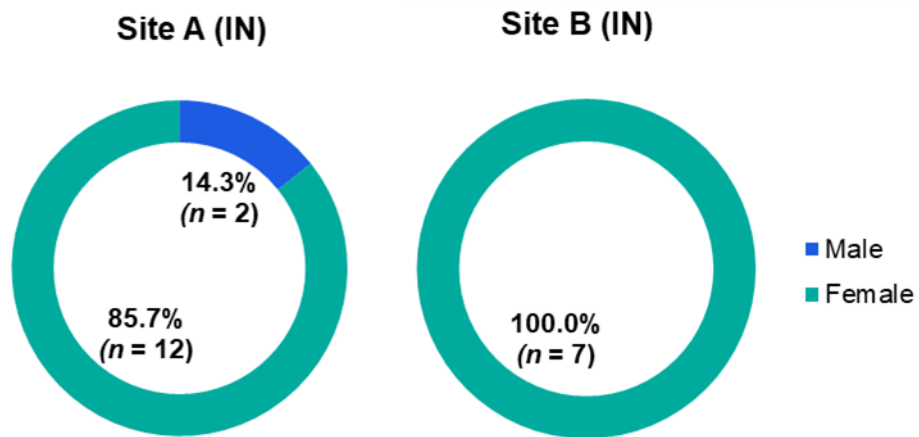
Please note thematic analysis inherently can be subject to bias in interpretation, therefore, other themes may be contained within the data. Unity Insights acts as an independent evaluator.

**Table 17: Thematic analysis framework**

Topic	Theme	Council	Provider
<b>System factors</b>	Retention / recruitment constraints	X	X
	Demand & supply factors	X	X
<b>Enablers to implementation</b>	LA and provider communication	X	
	LA understanding of provider processes		X
<b>Barriers to implementation</b>	Continuity of care (staff & clients)		X
	Time & skill requirements for data processing		X
	Nuance in rota requirements (staff & client preference)		X
	Provider resistance to change	X	
	Time requirements for project engagement	X	X
<b>Impacts</b>	Travel distance reduction		X
	Rota efficiency improvement		X
<b>Other</b>	Easier to implement at second attempt		X

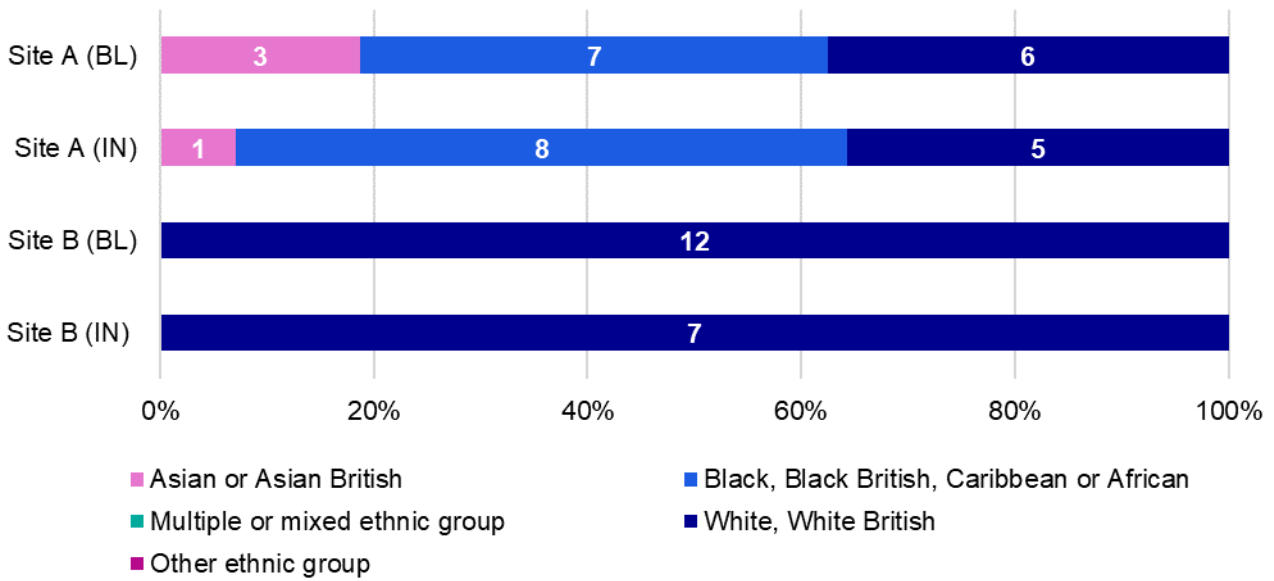
## 9.9. Appendix I: Cohort characteristics

The gender of respondents is presented in Figure 35, ethnicity in Figure 36, and the self-reported employee contract types in Figure 37.



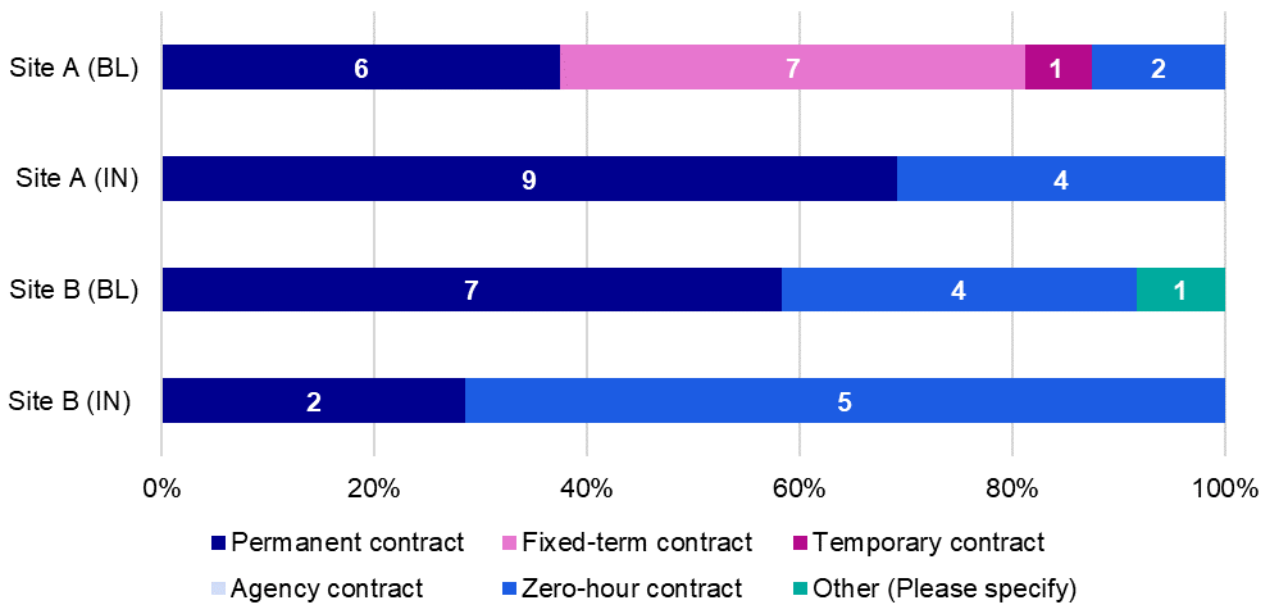
**Figure 35: Proportion of genders reported by respondents at each site.**

Results in Figure 35 indicate that there are more female care workers across both sites, with only a few male respondents in Site A ( $n = 2/14$ ) and no male respondents in Site B. While only the intervention data is presented, the proportion of male and female care workers remained consistent with the baseline at each site [Site A (BL): 87.5% Female ( $n = 14$ ); Site B (BL): 100.0% Female ( $n = 12$ )].



**Figure 36: Breakdown of the ethnicities of respondents at each site.**

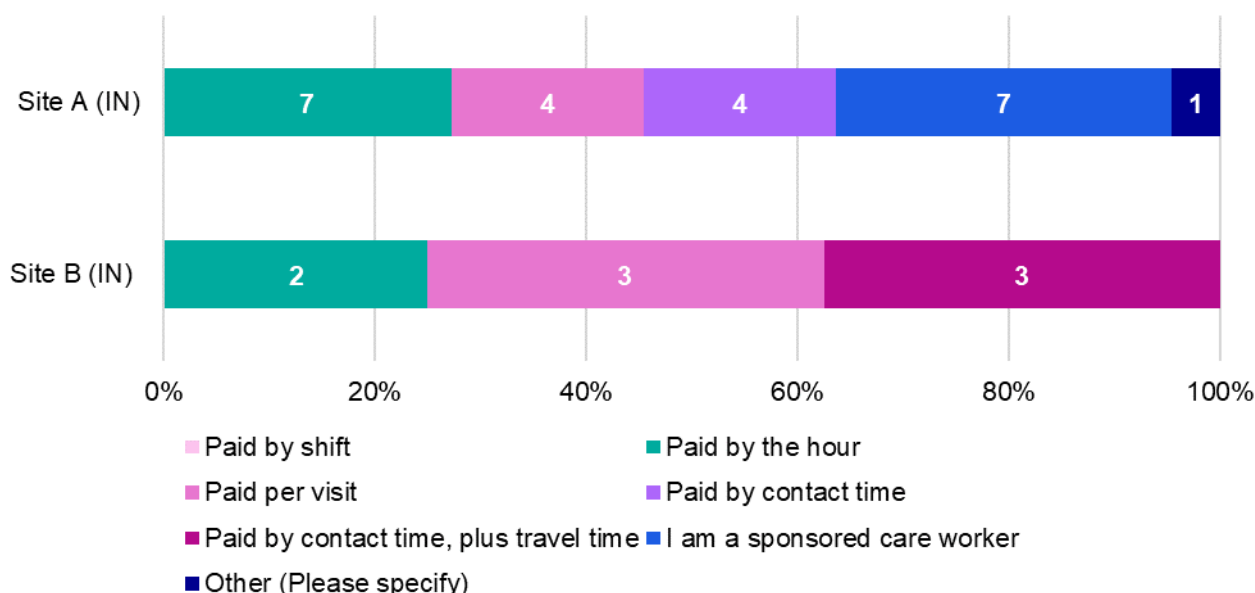
Figure 36 highlights a key difference between the sites in terms of the ethnicity of respondents, with Site B reporting only White British, and Site A reporting a more diverse range of ethnicities. Trends observed for ethnicity are generally consistent between the baseline and intervention periods.



**Figure 37: Chart showing the breakdown of self-reported employee contract types per site. The one ‘other’ response was recorded as “Don’t know”.**

For the employee contract types (Figure 37), Site A reported fewer respondents on fixed-term contracts and a higher proportion on permanent contracts in the intervention period compared with the baseline. Site B reported a higher proportion of respondents on zero-hour contracts alongside a lower proportion on permanent contracts during the intervention period than was reported during the baseline period.

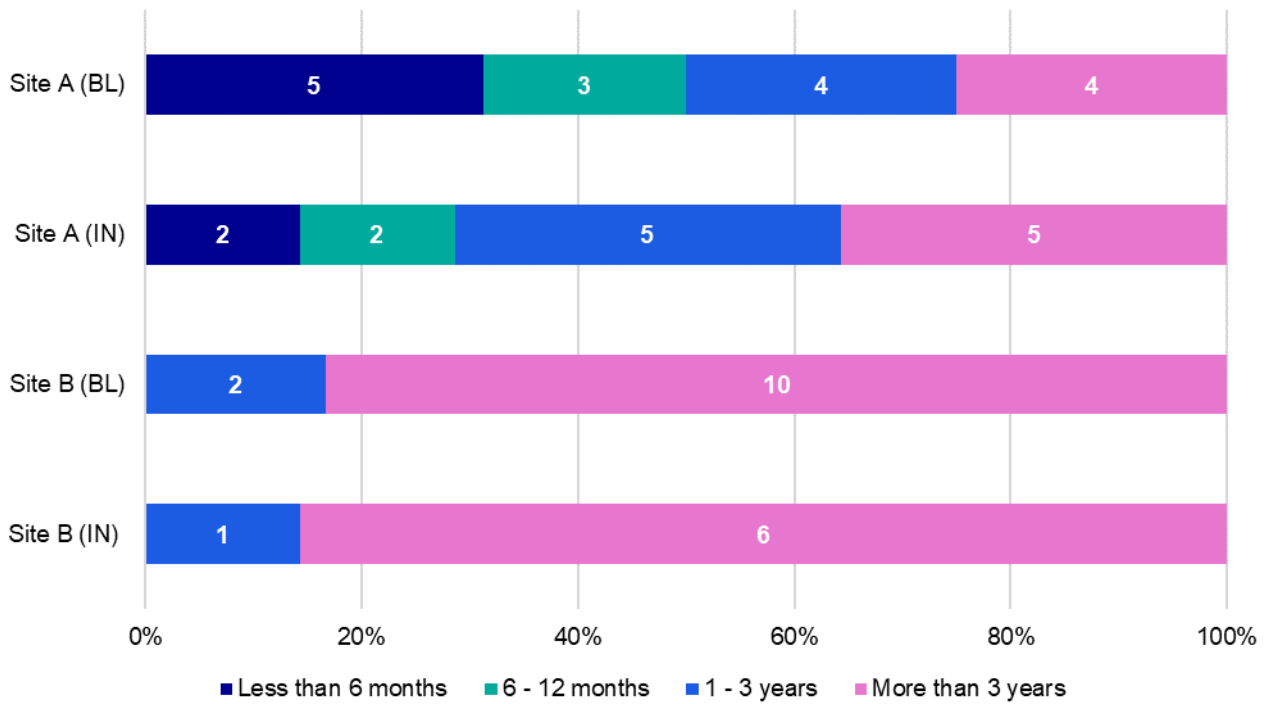
Respondents were asked to select which features of their employment terms applied to them, including details on how they are paid, and whether or not they have a work visa that requires sponsorship (Figure 38). Respondents were able to select all options which apply. This question was a new addition to the intervention survey; therefore, it cannot be compared against a baseline.



**Figure 38: Respondent employment terms split by site (all that apply).**

Results show some differences between sites in terms of how the care workers are paid, with three respondents in Site B reporting being paid contact time plus travel time, however, Site A, had no responses indicating pay for contact time plus travel time. Both sites indicated that some care workers were paid per visit, and some paid by the hour. Site A also reported a high number of sponsored care workers ( $n = 7$ ), i.e., workers who require entry clearance or permission to work in the United Kingdom as a skilled worker, compared with none in Site B. The one ‘other’ response for Site A noted that they were on a salary.

Respondents were asked to indicate how long they had been a care worker (Figure 39).



**Figure 39: How long respondents have been care workers by site.**

Results in Figure 39 show consistency in responses between the baseline and intervention periods for each site. Site A has a higher proportion of respondents who have been a care worker for less than three years, with a higher proportion of respondents in the baseline survey reporting that they had been a care worker for less than six months. Site B had a significantly higher proportion of respondents who had been care workers for more than 3 years, and none with less than one year of experience. This trend was consistent across both baseline and intervention periods.





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